# ACADEMIC REGULATIONS PROGRAMME STRUCTURE AND DETAILED SYLLABUS

# GR22

# Bachelor of Technology Computer Science and Engineering (AIML)

(Effective for the students admitted from the Academic Year 2022-23)


## GOKARAJU RANGARAJU

### INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous)


# GOKARAJU RANGARAJU

## INSTITUTE OF ENGINEERING AND TECHNOLOGY

**Bachupally, Kukatpally, Hyderabad-500090,Telangana**

**Tel: +91 7207344440**

**URL: www.griet.ac.in, E-Mail: info@griet.ac.in**

# ACADEMIC REGULATIONS
# PROGRAMME STRUCTURE
# &
# DETAILED SYLLABUS

## Bachelor of Technology
## Computer Science and Engineering
## (AIML)

(Four Year Regular Programme)
(Applicable for Batches Admitted from 2022-23)


**GOKARAJU RANGARAJU**

**INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**Bachupally, Kukatpally, Hyderabad, Telangana, India- 500090**

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**HYDERABAD**
**Academic Regulations for B.Tech (Regular) under GR22**
**(Applicable for Batches Admitted from 2022-23)**

**Under Graduate Degree Programme in Engineering and Technology (UG)**

Gokaraju Rangaraju Institute of Engineering and Technology (GRIET) offers a 4-year (8 Semesters) Bachelor of Technology (B.Tech) degree programme. The following programmes are offered in GRIET.

| S.No | Department | Programme Code | Programme |
|---|---|---|---|
| 1 | Civil Engineering | 01 | B.Tech Civil Engineering |
| 2 | Electrical and Electronics Engineering | 02 | B.Tech Electrical and Electronics Engineering |
| 3 | Mechanical Engineering | 03 | B.Tech Mechanical Engineering |
| 4 | Electronics and Communication Engineering | 04 | B.Tech Electronics and Communication Engineering |
| 5 | Computer Science and Engineering | 05 | B.Tech Computer Science and Engineering |
| 6 | Information Technology | 12 | B.Tech Information Technology |
| 7 | Computer Science and Business System | 32 | B.Tech Computer Science & Business System |
| 8 | Computer Science and Engineering (AIML) | 66 | B.Tech Computer Science and Engineering (AIML) |
| 9 | Computer Science and Engineering (Data Science) | 67 | B.Tech Computer Science and Engineering (Data Science) |
| 10 | Computer Science and Engineering (Artificial Intelligence) | 61 | B.Tech Computer Science and Engineering (Artificial Intelligence |
| 11 | Computer Science and Information Technology | 33 | B.Tech Computer Science and Information Technology |

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below.

1. **Medium of Instruction:** The medium of instruction (including examinations and reports) is English.

2. **Admissions:** Admission to the undergraduate (UG) Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the Telangana State Government/JNTUH University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.

3. **Programme Pattern:**

**a)** Each Academic Year of study is divided into two semesters.

**b)** Minimum number of instruction days in each semester is 90.

**c)** Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

**d)** The total credits for the Programme are 160.

**e)** A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.

**f)** All the registered credits except Mandatory and Value Added Courses will be considered for the calculation of final CGPA.

**g)** Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.

**h) Course Classification:** All courses offered for all undergraduate programmes in B.Tech degree programmes are broadly classified as follows.

| S. No. | Broad Course Classification | Course Group/ Category | Course Description |
|---|---|---|---|
| 1 | BS | Basic Science | Includes Basic Science Courses |
| 2 | ES | Engineering Science | Includes Engineering Courses |
| 3 | HS | Humanities andSocial Sciences | Includes Management Courses |
| 4 | PC | Professional Core | Includes Core Courses related to the parent discipline/department/ branch ofEngineering |
| 5 | PE | Professional Elective | Includes Elective Courses related to the parent discipline/ department/ branch of Engineering |
| 6 | OE | Open Elective | Elective Courses from other technicaland/or emerging subjects |
| 7 | PW | Project Work | Project work, seminar and internship in industry or elsewhere |
| 8 | MC | Mandatory Courses | Environmental Sciences, Induction training, Indian Constitution, Essence ofIndian Traditional Knowledge, Co and Extra Curricular Activities |
| 9 | VAC | Value Added Courses | Courses on current industry relevant topics improving breadth and depth in domain |

4. **Award of B.Tech Degree:** The Undergraduate Degree of B.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the following academic requirements for the award of the degree

**a)** A student pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.

**b)** A student has to register for all the 160 credits and secure all credits (with CGPA $\geq$ 5).

**c)** A student must fulfill all the academic requirements for the award of the degree.

## 5. Attendance Requirements:

**a)** A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.

**b)** Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.

**c)** Students who have been granted condonation shall pay a fee as decided by theFinance Committee.

**d)** Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.

**e)** Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. **They get detained and their registration for that semester shall stand cancelled**, including all academic credentials (internal marks etc.,) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be reregistered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

## 6. Paper Setting, Evaluation of Answer Scripts, Marks and Assessment:

**a)** Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.

**b)Distribution and Weightage of marks**

| S. No | Components | Internal | External | Total |
|---|---|---|---|---|
| 1 | Theory | 40 | 60 | 100 |
| 2 | Practical | 40 | 60 | 100 |
| 3 | Graphics for Engineers | 40 | 60 | 100 |
| 4 | Mini Project | 40 | 60 | 100 |
| 5 | Project Work | 40 | 60 | 100 |

**c)Continuous Internal Evaluation and Semester End Examinations:** The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The marks for each of the component of assessment are fixed as Shown in the following Table.

**Assessment Procedure:**

| S. No | Component of Assessment | Marks Allotted | Type of Assessment | Scheme of Examinations |
|---|---|---|---|---|
| 1 | Theory | 40 | Internal Examination & Continuous Evaluation | 1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered<br>**i) Subjective – 20 marks**<br>**ii) Objective – 10 marks**<br>2) Continuous Evaluation is for each unit using<br>**i) Assignment – 05 marks**<br>**ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks** |
| | | 60 | Semester end examination | The semester-end examination is for a duration of 3 hours |
| 2 | Practical | 40 | Internal Examination & Continuous Evaluation | One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes.<br>**i) Internal Exam-10 marks**<br>**ii) Viva voce – 10 marks**<br>**iii) Continuous Assessment- 10 marks**<br>**iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development -10 marks** |
| | | 60 | Semester end examination | The semester-end examination is for a duration of 3 hours.<br>**i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks**<br>**ii) task/experiment/program-15 marks**<br>**iii) evaluation of results -15 marks**<br>**iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks**<br>**v) viva-voce on concerned laboratory course - 10 marks** |

| | | | | |
|---|---|---|---|---|
| 3 | Graphics for Engineers | 40 | Internal Examination & Continuous Evaluation | 1) Two mid semester examination shall be conducted for 15 marks each for a duration of 90 minutes. Average of the two mid exams shall be considered<br>2) Day-to-Day activity -15 marks<br>3) Continuous Evaluation using<br>• **Assignment – 05 marks**<br>• **Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks** |
| | | 60 | Semester end examination | The semester-end examination is for a duration of 3 hours |

**d)Mini Project:**

| S. No | Component of Assessment | Marks Allotted | Type of Assessment | Scheme of Examinations |
|---|---|---|---|---|
| 1 | Mini Project | 40 | Continuous Evaluation & Internal Evaluation | 1) The supervisor continuously assesses the students for 20 marks<br>**i) Continuous Assessment – 15 marks**<br>• Abstract Presentation - 3 marks<br>• Architectural Design Presentation - 3 marks<br>• Modules Presentation - 3 marks<br>• Execution Cycle 1 Presentation - 3 marks<br>• Execution Cycle 2 Presentation - 3 marks<br>**ii) Report – 5 marks**<br>2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for **10 marks**.<br>3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – **10 marks** |
| | | 60 | External Evaluation | The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**. |

Note:

**i)** Mini Project Review Committee consists of HoD, Mini Project Coordinator and Supervisor.

**ii)** Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

**e)Internship/SkillDevelopmentCourse/ Industrial Training:** Internship/Skill Development Course/Industrial Training shall be done by the student immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship/Skill Development Course/Industrial Training at reputed organization shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination.

**f)Project Work (Phase–I and Phase-II):**

| S. No | Component of Assessment | Marks Allotted | Type of Assessment | Scheme of Examinations |
|---|---|---|---|---|
| 1 | Project Work (Phase- I and Phase -II) | 40 | Continuous Evaluation & Internal Evaluation | 1) The supervisor continuously assesses the students for 20 marks<br>**i) Continuous Assessment – 15 marks**<br>• Abstract Presentation - 3 marks<br>• Architectural Design Presentation - 3 marks<br>• Modules Presentation - 3 marks<br>• Execution Cycle 1 Presentation - 3 marks<br>• Execution Cycle 2 Presentation – 3 marks<br>**ii) Report – 5 marks**<br>2) At the end of the semester, Project work shall be displayed in the road show at the department level. Project work is evaluated by Project Review Committee for **10 marks**.<br>3) Technical Event Participation in project area/ MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/Book Publication – **10 marks.** |
| | | 60 | External Evaluation | The Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for **60 marks**. |

Note:

**i)** Project Review Committee consists of HoD, Project Coordinator and Supervisor.

**ii)** Plagiarism check is compulsory for project work report (Phase I and Phase II) as per the plagiarism policy of GRIET.

**iii)** The above rules are applicable for both Phase I and Phase II.

**g)** The evaluation of courses having ONLY internal marks in I-Year I Semester and II Semester is as follows:

- I Year courses: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.
- II Year II Semester *Real-Time/Field-based Research Project/Societal Related Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

7. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting of his/her answer book on payment of a prescribed fee.

8. **Re-evaluation of the End Examination Answer Books:** A student can request for re- evaluation of his/her answer book on payment of a prescribed fee.

9. **Supplementary Examinations:** A student who has failed to secure the required credits can register for a supplementary examination, as per the schedule announced by the College for a prescribed fee.

10. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices during Mid/ End-examinations as per the rules framed by the Academic Council.

11. **Re-registration for mid examination:** A student shall be given one time chance to re-register for a maximum of two subjects in a semester:
    - If the internal marks secured by a student in Continuous Internal Evaluation marks for 40 (sum of average of 2 mid-term examinations, average of all assignments and Subject Viva-voce/ PPT/Poster Presentation/Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects

    A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork when the course is offered next, it could be semester for first years and a year for others.

    In the event of the student taking this chance, his/her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

12. **Academic Requirements and Promotion Rules:**

    **a)** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40), not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

The student is eligible to write Semester End Examination of the concerned subject/course if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.
In case, the student appears for Semester End Examination (SEE) of the concerned subject/course but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his/her performance in that subject/course in SEE shall stand cancelled inspite of appearing the SEE.

**b)** A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

| S.No | Promotion | Conditions to be fulfilled |
|---|---|---|
| 1 | First year first semester toFirst year second semester | Regular course of study of First year first semester. |
| 2 | First year second semester to Second year first semester | **(i)** Regular course of study of First year second semester.<br>**(ii)** Must have secured at least 50% credits upto Firstyear second semesterfrom all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Second year first semester to Second year second semester | Regular course of study of Second year first semester. |
| 4 | Second year second semester to Third year first semester | **(i)** Regular course of study of Second year second semester<br>**(ii)** Must have secured at least 60% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Third year first semester to Third year second semester | Regular course of study of Third year first semester. |
| 6 | Third year second semesterto Fourth year first semester | **(i)** Regular course of study of Third year second semester.<br>**(ii)** Must have secured at least 60% credits up to Third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 7 | Fourth year first semester to Fourth year second semester | Regular course of study of Fourth year first semester. |

**c)** Provision of opting 2 OE courses through online mode.
**d)** Choice of placement-oriented value-added courses in every semester from II year till IV year
**e)** Students can take a year break after second or third year to work on R&D
**f)** Under Mandatory Courses
**i)Co-Curricular activities** -- 0.5 credit for publishing paper, publishing patent, attend seminar, technical competition and taking part in hackathon
**ii) Extra-Curricular activities** -- 0.5 credit for sports represent University or part or college winning team a medal or cup in outside recognized inter collegiate or above tournaments or NSS activities or donated blood two times or 2 green campus events

13. **Grade Points:** A 10 - point grading system with corresponding letter grades and percentage of marks, as given below, is followed

| Letter Grade | Grade Point | Percentage of marks |
|---|---|---|
| O (Outstanding) | 10 | Marks >= 90 |
| A+ (Excellent) | 9 | Marks >= 80 and Marks < 90 |
| A (Very Good) | 8 | Marks >= 70 and Marks < 80 |
| B+ (Good) | 7 | Marks >= 60 and Marks < 70 |
| B (Average) | 6 | Marks >= 50 and Marks < 60 |
| C (Pass) | 5 | Marks >= 40 and Marks < 50 |
| F (Fail) | 0 | Marks < 40 |
| Ab (Absent) | 0 | |

Letter grade 'F' in any Course implies failure of the student in that course and no credits of the above table are earned.

**Computation of SGPA and CGPA:**

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

**i)** **Sk** the SGPA of **k**$^{th}$ semester (1 to 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

$$SGPA\ (S_k) = \sum_{i=1}^{n} (C_i * G_i) / \sum_{i=1}^{n} C_i$$

Where **Ci** is the number of credits of the **i**$^{th}$ course and **Gi** is the grade point scored by the student in the **i**$^{th}$ course and **n** is the number of courses registered in that semester.

**ii)** The CGPA is calculated in the same manner taking into account all the courses **m**, registered by student over all the semesters of a programme, i.e., up to and inclusive of **Sk**, where **k** ≥ **2**.

$$CGPA = \sum_{i=1}^{m} (C_i * G_i) / \sum_{i=1}^{m} C_i$$

**iii)** The SGPA and CGPA shall be rounded off to 2 decimal points.

14. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 160 credits.

| S. No | Class Awarded | CGPA Secured |
|---|---|---|
| 1 | First Class with Distinction | CGPA >= 8.00 with no F or below grade/ detention anytime during the programme |
| 2 | First Class | CGPA >= 8.00 with rest of the clauses of S.No 1 not satisfied |
| 3 | First Class | CGPA ≥ 6.50 and CGPA < 8.00 |
| 4 | Second Class | CGPA ≥ 5.50 and CGPA < 6.50 |
| 5 | Pass Class | CGPA ≥ 5.00 and CGPA < 5.50 |

Equivalence of grade to marks

Marks % = (CGPA -0.5)*10

15. **Award of 2-Year B.Tech Diploma Certificate**

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B. Tech. – II Year – II Semester if the student want to exit the 4-Year B. Tech. program and requests for the 2-Year B.Tech (UG) Diploma Certificate.

2. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree. ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.

3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.

4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

16. **Withholding of Results:** If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be withheld and the student will not be allowed to go into the next semester. The award or issue of the Degree may also be withheld in such cases.

17. **Transitory Regulations**

**A.** For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR22 Regulations and he is required to complete the study of B.Tech programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II, III and IV years of GR20 regulations for want of attendance, shall be permitted to join the corresponding semester of GR22 Regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The GR22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

**B.** For students detained due to shortage of credits:

3. A student of GR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR20 & GR22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

**C.** For readmitted students in GR22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR22 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to GR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR22 Regulations will be substituted by another subject to be suggested by the college academic administration.

**Note:**

If a student readmitted to GR22 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in GR22 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

## 18. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges / Universities:

**a)** Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis.

**b)** There shall be no branch transfers after the completion of admission process.

**c)** The students seeking transfer to GRIET from various other Universities/institutions have to pass the failed courses which are equivalent to the courses of GRIET, and also pass the courses of GRIET which the students have not studied at the earlier institution. Further, though the students have passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GRIET, the students have to study those courses in GRIET in spite of the fact that those courses are repeated.

**d)** The transferred students from other Universities/institutions to GRIET who are on rolls are to be provided one chance to write the CBT (internal marks) in the **equivalent course(s)** as per the clearance (equivalence) letter issued by the University.

## 19. General Rules

a. The academic regulations should be read as a whole for the purpose of any interpretation.
b. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
c. In case of any error in the above rules and regulations, the decision of the Academic Council is final.
d. The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

**Academic Regulations for B.Tech (Lateral Entry) under GR22**
**(Applicable for Batches Admitted from 2022-23)**

1. All regulations as applicable for B.Tech 4-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules:
   **a)** Pursued programme of study for not less than three academic years and not more than six academic years.
   **b)** A student should register for all 120 credits and secure all credits. The marks obtained in all 120 credits shall be considered for the calculation of the final CGPA.
   **c)** Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

2. **Academic Requirements and Promotion Rules:**
   **a)** A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end Examination taken together.
   **b)** A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

| S. No. | Promotion | Conditions to be fulfilled |
|---|---|---|
| 1 | Second year first semester to Second year second semester. | Regular course of study of Second year first semester. |
| 2 | Second year second semester to Third year first semester. | Regular course of study of Second year second semester.<br>Must have secured at least 50% credits up to Second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Third year first semester to Third year second semester. | Regular course of study of Third year first semester. |
| 4 | Third year second semester to Fourth year first semester. | Regular course of study of Third year second semester.<br>Must have secured at least 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Fourth year first semester to Fourth year second semester. | Regular course of study of Fourth year first semester. |

**3.Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 120 credits

| S. No | Class Awarded | CGPA Secured |
|---|---|---|
| 1 | First Class with Distinction | CGPA >= 8.00 with no F or below grade/ detention anytime during the Programme |
| 2 | First Class | CGPA >= 8.00 with rest of the clauses of S.no 1 not satisfied |
| 3 | First Class | CGPA ≥ 6.50 and CGPA < 8.00 |
| 4 | Second Class | CGPA ≥ 5.50 and CGPA < 6.50 |
| 5 | Pass Class | CGPA ≥ 5.00 and CGPA < 5.50 |

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## (Autonomous)

Bachupally, Kukatpally, Hyderabad–500090, India.

## B. Tech Artificial Intelligence & Machine Learning GR22 Course Structure

### I B. Tech CSE(AIML) - I Semester

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | Maths | BS | GR22A1001 | Linear Algebraand Function Approximation | 3 | 1 | 0 | 4 | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | Physics | BS | GR22A1003 | Applied Physics | 3 | 1 | 0 | 4 | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | English | HS | GR22A1006 | English | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 4 | CSE | ES | GR22A1007 | Programmingfor Problem Solving | 2 | 1 | 0 | 3 | 2 | 1 | 0 | 3 | 40 | 60 | 100 |
| 5 | ME | ES | GR22A1011 | Graphics for Engineers | 1 | 0 | 2 | 3 | 1 | 0 | 4 | 5 | 40 | 60 | 100 |
| 6 | Physics | BS | GR22A1013 | Applied Physics Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 7 | CSE | ES | GR22A1017 | Programming forProblem Solving Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 8 | Englis h | HS | GR22A1016 | English Language and CommunicationSkills Lab | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 40 | 60 | 100 |
| **TOTAL** | | | | | **11** | **3** | **6** | **20** | **11** | **3** | **12** | **26** | **320** | **480** | **800** |
| 9 | Mgmt | MC | GR22A1022 | Design Thinking | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 40 | 60 | 100 |

### I B. Tech CSE(AIML) - II Semester

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | Maths | BS | GR22A1002 | Differential Equations and Vector Calculus | 3 | 1 | 0 | 4 | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | Chemistry | BS | GR22A1005 | Engineering Chemistry | 3 | 1 | 0 | 4 | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | EEE | ES | GR22A1008 | Fundamentalsof Electrical Engineering | 2 | 1 | 0 | 3 | 2 | 1 | 0 | 3 | 40 | 60 | 100 |
| 4 | CSE | ES | GR22A1012 | Data Structures | 2 | 1 | 0 | 3 | 2 | 1 | 0 | 3 | 40 | 60 | 100 |
| 5 | Chemistry | BS | GR22A1015 | Engineering Chemistry Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 6 | EEE | ES | GR22A1019 | Fundamentals of Electrical EngineeringLab | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 40 | 60 | 100 |
| 7 | CSE | ES | GR22A1020 | Data Structures Lab | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 40 | 60 | 100 |
| 8 | ME | ES | GR22A1021 | Engineering Workshop | 1 | 0 | 1.5 | 2.5 | 1 | 0 | 3 | 4 | 40 | 60 | 100 |
| **TOTAL** | | | | | **11** | **4** | **5** | **20** | **11** | **4** | **10** | **25** | **320** | **480** | **800** |

**II B. Tech CSE(AIML) - I Semester**

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | IT | PC | GR22A2067 | Digital Logic Design | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | IT | PC | GR22A2068 | Java Programming | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | CSE | PC | GR22A2075 | Discrete Mathematics | 2 | 1 | 0 | 3 | 2 | 1 | 0 | 3 | 40 | 60 | 100 |
| 4 | Mgmt | HS | GR22A2004 | Economics and Accounting for Engineers | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | IT | PC | GR22A2069 | Database Management Systems | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | CSE | PC | GR22A2085 | Scripting Languages Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 7 | IT | PC | GR22A2071 | Java Programming Lab | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 40 | 60 | 100 |
| 8 | IT | PC | GR22A2072 | Database Management Systems Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| **TOTAL** | | | | | **14** | **1** | **5** | **20** | **14** | **1** | **10** | **25** | **320** | **480** | **800** |
| 9 | HS | MC | GR22A2002 | Value Ethics and Gender Culture | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 10 | English | MC | GR22A2108 | Effective Technical Communication | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 40 | 60 | 100 |

**II B. Tech CSE(AIML) - II Semester**

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | IT | PC | GR22A2073 | Computer Organization | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | CSE | PC | GR22A2074 | Operating systems | 2 | 1 | 0 | 3 | 2 | 1 | 0 | 3 | 40 | 60 | 100 |
| 3 | Maths | BS | GR22A2006 | Applied Statistics for Engineers | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | CSE | PC | GR22A2076 | Full Stack Web Development | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | IT | PC | GR22A2077 | Design andAnalysis of Algorithms | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | CSE | PC | GR22A2078 | Full Stack Web DevelopmentLab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 7 | CSE | PC | GR22A2079 | OperatingSystems Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 8 | CSE | PC | GR22A2080 | Visual Programmingusing C# and Net Lab | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 40 | 60 | 100 |
| **TOTAL** | | | | | **14** | **1** | **5** | **20** | **14** | **1** | **10** | **25** | **320** | **480** | **800** |
| 9 | HS | MC | GR22A2001 | Environmental Science | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 40 | 60 | 100 |
| 10 | CSE | MC | GR22A2109 | Real-time Research Project/ Societal Related Project | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 50 | -- | 50 |

**III B. Tech CSE(AIML) - I Semester**

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | CSE | PC | GR22A3044 | Computer Networks | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | CSE(AIML) | PC | GR22A3069 | Data Warehousing and Data Mining | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | CSE(AIML) | PC | GR22A3070 | Artificial Intelligence | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | PE | | Professional Elective-I | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | OE | | Open Elective – I | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | CSE(AIML) | PC | GR22A3073 | Data Warehousing and Data Mining Lab | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 40 | 60 | 100 |
| 7 | CSE(AIML) | PC | GR22A3074 | Artificial Intelligence Lab using python | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 8 | CSE | PC | GR22A2070 | R Programming Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| **TOTAL** | | | | | **15** | **0** | **5** | **20** | **15** | **0** | **10** | **25** | **320** | **480** | **800** |

| PROFESSIONAL ELECTIVE – I | | | |
|---|---|---|---|
| S. No. | BOS | Course Code | COURSE |
| 1 | CSE | GR22A3047 | Principles of Programming Languages |
| 2 | IT | GR22A3125 | Mobile Application Development |
| 3 | CSE(AIML) | GR22A3071 | Formal Languages and Automata Theory |
| 4 | IT | GR22A3126 | Cloud Computing |

| OPEN ELECTIVE – I | | | |
|---|---|---|---|
| S. No | BOS | Course Code | Course |
| 1 | CSE(AIML) | GR22A3072 | Basics of Java Programming |

**III B. Tech CSE(AIML) - II Semester**

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | CSE(AIML) | PC | GR22A3140 | Machine Learning | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | CSE(DS) | PC | GR22A3143 | Big Data Analytics | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | IT | PC | GR22A3052 | Software Engineering | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | PE | | Professional Elective- II | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | OE | | Open Elective-II | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | CSE(AIML) | PC | GR22A3142 | Machine Learning Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 7 | CSE(DS) | PC | GR22A3148 | Big Data Analytics Lab | 0 | 0 | 1.5 | 1.5 | 0 | 0 | 3 | 3 | 40 | 60 | 100 |
| 8 | CSE(AIML) | PW | GR22A3089 | Mini Project with Seminar | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 40 | 60 | 100 |
| **TOTAL** | | | | | **15** | **0** | **5** | **20** | **15** | **0** | **10** | **25** | **320** | **480** | **800** |
| 9 | Mgmt | MC | GR22A2003 | Constitution of India | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 40 | 60 | 100 |

| PROFESSIONAL ELECTIVE – II | | | |
|---|---|---|---|
| S. No. | BOS | Course Code | COURSE |
| 1 | CSE | GR22A3119 | Software Architecture |
| 2 | IT | GR22A3126 | Cloud Computing |
| 2 | CSE(DS) | GR22A3076 | Data Visualization |
| 4 | CSE | GR22A3119 | Software Architecture |

| OPEN ELECTIVE – II | | | |
|---|---|---|---|
| S. No | BOS | Course Code | Course |
| 1 | CSE(AIML) | GR22A3141 | Introduction to DBMS |

**IV B. Tech CSE(AIML) - I Semester**

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | CSE | PC | GR22A4048 | Cryptography and Network Security | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | CSE(AIML) | PC | GR22A3118 | Neural Networks and Deep Learning | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | | PE | | Professional Elective – III | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | PE | | Professional Elective – IV | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | OE | | Open Elective - III | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | CSE | PC | GR22A4055 | Cryptography and Network Security Lab | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 40 | 60 | 100 |
| 7 | CSE(AIML) | PC | GR22A4081 | Deep Learning Lab | 0 | 0 | 2 | 2 | 0 | 0 | 4 | 4 | 40 | 60 | 100 |
| 8 | CSE(AIML) | PW | GR22A4082 | Project work - Phase I | 0 | 0 | 6 | 6 | 0 | 0 | 12 | 12 | 40 | 60 | 100 |
| **TOTAL** | | | | | **15** | **0** | **10** | **25** | **15** | **0** | **20** | **35** | **320** | **480** | **800** |

| PROFESSIONAL ELECTIVE – III | | | |
|---|---|---|---|
| **S. No.** | **BOS** | **Course Code** | **COURSE** |
| 1 | CSE(AIML) | GR22A4078 | Compiler Design |
| 2 | CSE | GR22A4051 | Image and Video Processing |
| 3 | CSE(AIML) | GR22A4079 | Natural Language Processing |
| 4 | IT | GR22A4127 | Agile Methodologies |

| PROFESSIONAL ELECTIVE – IV | | | |
|---|---|---|---|
| **S. No.** | **BOS** | **Course Code** | **COURSE** |
| 1 | CSE | GR22A4052 | Information Storage and Management |
| 2 | CSE | GR22A4053 | Multimedia Applications |
| 3 | IT | GR22A4131 | Distributed Database and Systems |
| 4 | IT | GR22A4058 | Software Testing Methodologies |

| OPEN ELECTIVE – III | | | |
|---|---|---|---|
| **S. No** | **BOS** | **Course Code** | **Course** |
| 1 | CSE(AIML) | GR22A4080 | Introduction to Data Mining |

**IV B. Tech CSE(AIML) - II Semester**

| S.No | BOS | Group | Course Code | Course Name | Credits | | | | Hours | | | | Int. | Ext | Total Marks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Total | L | T | P | Total | | | |
| 1 | Mgmt | HS | GR22A3116 | Fundamentals of Management and Entrepreneurship | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | | PE | | Professional Elective-V | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | | PE | | Professional Elective-VI | 3 | 0 | 0 | 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | CSE(AIML) | PW | GR22A4145 | Project work - Phase II | 0 | 0 | 6 | 6 | 0 | 0 | 12 | 12 | 40 | 60 | 100 |
| **TOTAL** | | | | | **9** | **0** | **6** | **15** | **9** | **0** | **12** | **21** | **160** | **240** | **400** |

| PROFESSIONAL ELECTIVE – V | | | |
|---|---|---|---|
| **S. No.** | **BOS** | **Course Code** | **COURSE** |
| 1 | CSE | GR22A4120 | Real Time Operating Systems |
| 2 | IT | GR22A4130 | Cyber Forensics |
| 3 | CSE(AIML) | GR22A4143 | Introduction to Robotics |
| 4 | IT | GR22A4063 | Design Patterns |

| PROFESSIONAL ELECTIVE – VI | | | |
|---|---|---|---|
| **S. No.** | **BOS** | **Course Code** | **COURSE** |
| 1 | IT | GR22A3037 | Soft Computing |
| 2 | IT | GR22A3054 | Computer Graphics |
| 3 | CSE(AIML) | GR22A4144 | Introduction to Drones |
| 4 | CSE | GR22A4125 | Software Product Development and Management |

## PROFESSIONAL ELECTIVES – 4 THREADS

| S. No. | Theory and Algorithms | Applications | Data Science and Machine Intelligence | Software and Technology |
|---|---|---|---|---|
| 1 | Principles of Programming Languages | Mobile Application Development | Formal Languages and Automata Theory | Cloud Computing |
| 2 | Software Architecture | Data Visualization | Data Science with R- Programming | Blockchain Technology |
| 3 | Compiler Design | Image & Video Processing | Natural Language Processing | Agile Methodologies |
| 4 | Information Storage And management | Multimedia Applications | Distributed Databases and Systems | Software Testing Methodologies |
| 5 | Real Time operating System | Cyber forensics | Introduction to Robotics | Design Patterns |
| 6 | Soft Computing | Computer Graphics | Introduction to Drones | Software Product Development and Management |

## OPEN ELECTIVES FOR GR22 REGULATIONS:

| THREAD 1 | THREAD 2 | OFFERED BY |
|---|---|---|
| Soft Skills and Interpersonal Skills (GR22A3145)<br>Human Resource Development and Organizational Behavior (GR22A4049)<br>Cyber Law and Ethics (GR22A4077)<br>Economic Policies in India (GR22A4147) | Data Science for Engineers (GR22A3049) | **CSE** |
| | Data Analytics using Open Source Tools (GR22A3120) | |
| | Augmented Reality and Virtual Reality (GR22A4054) | |
| | Basics of Java Programming (GR22A3072) | **CSE (AIML)** |
| | Introduction to DBMS (GR22A3141) | |
| | Introduction to Data Mining (GR22A4080) | |
| | Programming in Python (GR22A3077) | **CSE (DS)** |
| | Internet of Things (GR22A3147) | |
| | Scripting Languages (GR22A4085) | |
| | Services Science and Service Operational Management (GR22A4134) | **CSBS** |
| | IT Project Management (GR22A4135) | |
| | Marketing Research and Marketing Management (GR22A4136) | |
| | Introduction to Data Science (GR22A3056) | **IT** |
| | User Centric Human Computer Interaction (GR22A3127) | |
| | Design Patterns (GR22A4063) | |
| | Non Conventional Energy Sources (GR22A3019) | **EEE** |
| | Concepts of Control Systems (GR22A3095) | |
| | Artificial Neural Networks and Fuzzy Logic (GR22A4022) | |
| | Principles of Communications (GR22A3040) | **ECE** |
| | Sensor Technology (GR22A3113) | |
| | Communication Technologies (GR22A4045) | |
| | Industrial Automation and Control (GR22A3030) | **ME** |
| | Composite Materials (GR22A3105) | |
| | Operations Research (GR22A3018) | |
| | Engineering Materials for Sustainability (GR22A3009) | **CE** |
| | Geographic Information Systems and Science (GR22A3086) | |
| | Environmental Impact Assessment (GR22A4011) | |
| | Basics of Java Programming (GR22A3072) | **CSE (AI)** |
| | Introduction to DBMS (GR22A3141) | |
| | Introduction to Data Mining (GR22A4080) | |
| | Introduction to Data Science (GR22A3056) | **CSIT** |
| | User Centric Human Computer Interaction (GR22A3127) | |
| | Design Patterns (GR22A4063) | |

# I YEAR
# I SEMESTER

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## LINEAR ALGEBRA AND FUNCTION APPROXIMATION

**Course Code: GR22A1001** **L/T/P/C: 3/1/0/4**
**I Year I Semester**

**Prerequisites**: Elementary knowledge of vectors, matrices and pre-calculus

**Course Outcomes**

1. Work with the essential tools of vector and matrix algebra
2. Compute eigenvalues and vectors for engineering applications
3. Illustrate matrix decomposition techniques to determine the exact or approximate solutions of a linear algebraic system.
4. Develop the skill of finding multivariable function optima
5. Illustrate the concepts of function approximation with measurement of error

**UNIT I**

**Fundamentals of Vector and Matrix algebra**

Operations on vectors and matrices- Orthogonal projection of vectors- Exact and generalized inverse of a matrix- Rank of a matrix- Linear independence of vectors- Structured square matrices (Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and unitary matrices)- Vector and matrix norms

Solution of a linear algebraic system of equations (homogeneous and non-homogeneous) using Gauss elimination

**UNIT II**

**Matrix eigenvalue problem and Quadratic forms**

Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof)- Similarity of matrices- Diagonalization of a matrix- Orthogonal diagonalization of a symmetric matrix- Definiteness of a symmetric matrix

Quadratic Forms- Definiteness and nature of a quadratic form- Reduction of a quadratic form to the canonical form using an orthogonal transformation

**UNIT III**

**Matrix decomposition and Least squares solution of algebraic systems**

LU decomposition- Cholesky decomposition- Gram-Schmidt orthonormalization process- QR factorization- Eigen decomposition of a symmetric matrix- Singular value decomposition

Least squares solution of an over determined system of equations using QR factorization and thegeneralized inverse- Estimation of the least squares error

**UNIT IV**

**Multivariable differential calculus and Function optimization**

Partial Differentiation- Chain rule- Total differentiation- Jacobian- Functional dependence Multivariable function Optimization- Taylor's theorem for multivariable functions-Unconstrained optimization of functions using the Hessian matrix- Constrained optimizationusing the Lagrange multiplier method

**UNIT V**

**Function approximation tools in engineering**

Function approximation using Taylor's polynomials- Properties of Chebyshev polynomials- Uniform approximation using Chebyshev polynomials

The principle of least squares- Function approximation using polynomial, exponential and powercurves using matrix notation- Estimating the Mean squared error

**Text Books:**

1. Advanced Engineering Mathematics, 5th edition, R.K.Jain and S.R.K.Iyengar, Narosa publishing house
2. Higher Engineering Mathematics- B.S.Grewal- Khanna publications

**Reference Books:**

1. Introduction to Linear Algebra, Gilbert Strang, 5th edition, Wellesley,2017.
2. Numerical methods for scientific and engineering computation, M.K.Jain, S.R.K.Iyengar, R.K.Jain- 3rd edition- New Age publishers
3. Applied Mathematics, Vol. I & II, P. N. Wartikar and J. N. Wartikar, Pune VidyarthiGriha Prakashan,2010

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## APPLIED PHYSICS

**Course Code: GR22A1003** **L/T/P/C: 3/1/0/4**

**I Year I Semester**

**Course Outcomes**

1. Solve engineering problems involving quantum nature of radiation and matter waves.
2. Describe the characteristics of semiconductor devices such as transistors and diodes.
3. Illustrate the operation of optoelectronic devices and its applications.
4. Analyze the properties of Laser and its propagation in different types of optical fibers.
5. Identify dielectric, magnetic and superconducting materials based on their properties for specific applications.

**UNIT I**

**Quantum Mechanics:** Introduction, Black body radiation, Planck's law, Photoelectric effect-Einstein's Photoelectric equation, Compton effect, Wave-Particle duality: de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional infinite potential box.

**UNIT II**

**Semiconductor Physics:** Intrinsic and extrinsic semiconductors, Estimation of carrier concentration in intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier concentration and variation with temperature, Carrier transport: diffusion and drift, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Hall Effect and its applications.

**UNIT III**

Optoelectronic Devices: Radiative transitions: Absorption, Spontaneous and Stimulated emissions, Non-radiative transitions: Auger recombination, Surface recombination and recombination at defects, Generation and recombination mechanism in semiconductors, Principle, Construction, Working, Characteristics and Applications: LED, PIN photo detector, Avalanche photo detector and Solar cell.

**UNIT IV**

**Lasers:** Introduction, Characteristics of lasers, Lasing action, Essential components of laser, Construction and working: Ruby laser, He-Ne laser and Semiconductor laser, Applications of lasers.

**Fiber Optics:** Introduction, Principle and Structure of an optical fiber, Basic components in optical fiber communication system, Comparison of optical fibers over conventional cables, Types of optical fibers, Acceptance angle-Numerical aperture, Losses associated with opticalfibers, Applications of optical fibers.

**UNIT V**

**Dielectric Materials:** Introduction, Types of polarizations: Electronic, Ionic and Orientation, Calculation of Electronic and Ionic polarizability, Internal fields in solids, Clausius-Mossotti equation, Applications of dielectric materials.

**Magnetic Materials:** Introduction, Bohr magneton, classification of magnetic materials: Ferro, Para, Dia, Antiferro and Ferri, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Applications of magnetic materials.

**Teaching methodologies:**

- White board and marker
- Power Point Presentations
- Video lectures

**Text books:**

1. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing.
2. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
3. Engineering Physics, P.K Palanisamy, Scitech Publishers.
4. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S.Chand.

**References:**

1. Fundamentals of Semiconductor Devices, Second Edition, Anderson and Anderson, McGraw Hill.
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Inc. (1995)
3. Semiconductor Physics and Devices, 4e, Neamen and Biswas, McGraw Hill.
4. Online Course: “Optoelectronic Materials and Devices” by Monica Katiyar and Deepak Guptha on NPTEL.Halliday and Resnick, Physics – Wiley.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## ENGLISH

**Course Code: GR22A1006** **L/T/P/C : 2/0/0/2**

**I Year I Semester**

**Course Outcomes:**

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Listen and respond appropriately.

**UNIT I**

**Where the Mind is without Fear poem by Rabindranath Tagore**
**Vocabulary**: The Concept of Word Formation -- The Use of Prefixes and Suffixes.
**Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.
**Reading:** Reading and Its Importance- Techniques for Effective Reading
**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation - Techniques for writing precisely - Paragraph writing - Do's and Don'ts of Paragraph Writing - Creating Coherence-Organizing Principles of Paragraphs in Documents.

**UNIT II**

**The Last Leaf by O. Henry Vocabulary:** Synonyms and Antonyms.
**Grammar:** Modal Auxiliaries - Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.
**Reading:** Sub-skills of Reading- Skimming and Scanning
**Writing:** Précis Writing, Describing Objects, Places and Events – Classifying - ProvidingExamples or Evidence

**UNIT III**

**'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.**
**Vocabulary**: Acquaintance with Prefixes and Suffixes from Foreign Languages in English toform Derivatives-Words from Foreign Languages and their Use in English.
**Grammar:** Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension
**Writing**: Format of a Formal Letter-Writing Formal Letters E.g. Letter of Complaint, Letter ofRequisition and Letter of permission, Use of phrases for formal and informal letter writing and EmailEtiquette

**UNIT IV**

**'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.**
**Vocabulary**: Standard Abbreviations in English and Phrasal Verbs **Grammar:** Redundancies and Clichés in Oral and Written Communication.**Reading**: Comprehension- Intensive Reading and Extensive Reading

**Writing:** Writing Introduction and Conclusion -Essay Writing- Argumentative andDiscursive essay – Picture Composition

**UNIT V**

**'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English forEngineers' published by Cambridge University Press.**
**Vocabulary**: One Word Substitutes, Technical vocabulary and their usage
**Grammar:** Common Errors in English
**Reading:** Reading Comprehension-Exercises for Practice
**Writing:** What is Report Writing - Technical Reports vs General Reports – Importance of Report Writing – Structure and characteristics of Report Writing - Relevance of Reports to Engineers

**Text Books:**

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.

**References:**

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**PROGRAMMING FOR PROBLEM SOLVING**

**Course Code: GR22A1007** **L/T/P/C:2/1/0/3**
**I Year I Semester**

**Course Outcomes:**

1. To design algorithms and flowcharts for problem solving and illustrate the fundamentalsof C language.
2. To identify and apply control structures and arrays to solve problems.
3. To discover the need for strings and functions in problem solving and apply it.
4. To analyze the need for pointers and structures in C and implement for solutions.
5. To interpret working with files, preprocessor directives and command line arguments inC.

**UNIT I**

**Introduction to Programming: Introduction to Algorithms:** Representation of Algorithm, Flowchart, Pseudo code with examples, compiling and executing programs, syntax and logical errors.

**Introduction to C Programming Language:** Structure of C program, Keywords, Variables, Constants, Datatypes, Operators, Precedence and Associativity, Expression evaluation, Implicit and Explicit Type conversion, Formatted and Unformatted I/O.

**UNIT II**

**Decision Making and Arrays: Branching and Loops:** Conditional branching with simple if, if-else, nested if else, else if ladder, switch-case, loops: for, while, do-while, jumping statements: goto, break, continue, exit.

**Arrays:** one and two dimensional arrays, creating, accessing and manipulating elements of arrays

**Searching:** Introduction to searching, Linear search and Binary search.

**UNIT III**

**Strings and Functions:**

**Functions:** Introduction to structured programming, Function Declaration, Signature of a function, Parameters and return type of a function, Categories of functions, Parameter passing techniques, Passing arrays and strings to functions, Recursion, merits and demerits of recursive functions, Storage classes

**Strings:** Introduction to strings, operations on characters, Basic string functions available in C - strlen, strcat, strcpy, strrev,strcmp , String operations without string handling functions, Arrays of strings.

**UNIT IV**

**Pointers and Structures: Pointers:** Idea of pointers, Declaration and initialization of pointers, Pointer to pointer, Void pointer, Null pointer, Pointers to Arrays and Structures, Function pointer.

**Structures and unions:** Defining structures, Declaring and Initializing structures, Arrays within structures, Array of structures, Nested structures, Passing structures to functions, Unions,Typedef.

**UNIT V**

**File handling and Preprocessor in c: Files:** Text and Binary files, Creating, Reading and Writing text and binary files, Random access to files, Error Handling in files.

**Preprocessor:** Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef, elif, Command line arguments, Enumeration data type.

**Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, CengageLearning, (3rd Edition)

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHallof India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# GRAPHICS FOR ENGINEERS

**Course Code: GR22A1011** **L/T/P/C: 1/0/4/3**
**I Year I Semester**

**Course Outcomes**

1. Interpret industrial drawings and read working drawings.
2. Draw engineering objects like springs using AutoCAD.
3. Imagine and create multi-views of 2-d plane figures.
4. Construct and interpret multi-views of 3-d solid objects with proper dimensioning, scaling etc.
5. Draw and create pictorial views and model the industrial objects like gears andbearings with solid modelling commands available in AutoCAD tool.

**UNIT I**

**Engineering Graphics with CAD–** Introduction engineering graphics and significance of computer aided design CAD software, advanced commands, dimensioning and tolerancing, fundamentals of 2-D construction.

**UNIT II**

**Orthographic projection –** Introduction, definition, and classification of projections; pictorial and multi-view, significance of first and third angle methods of projections; **Projections of points** (in all quadrants) and **straight lines** (inclined to one reference plane only).

**UNIT III**

**Projections of planes -** definition and types of plane figures (triangle, square, pentagon, hexagon, and circle); projections of plane (inclined to one reference plane only).

**UNIT IV**

**Projections of solids -** definition and types of solid objects (prism, cylinder, pyramid, and cone); projections of solid (axis inclined to one reference plane only); creation of threads, washers, keys, and springs.

**UNIT V**

**Isometric views –** construction of isomeric views of planes (polygons) and solids (prism, cylinder, pyramid, and cone); fundamentals of 3-d drawings, world coordinate system, solid modelling and commands, creation of gears and bearings; conversion of 3-d to 2-d views and construction of 3-d view from 2-d views (simple objects)

**Text Books:**

1. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh
2. Engineering Drawing by N.D.BHATT/CHAROTAR PUBLISHING HOUSE PVT LTD

**Reference Books:**

1. Engineering Graphics Essentials with AutoCAD 2018 Instruction by Kirstie Platenberg/SDC publications.
2. Engineering Drawing by Basanth Agrawal/ C M Agrawal/ McGraw Hill Education
3. Engineering Drawing by K.Venu Gopal/New Age Publications.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**APPLIED PHYSICS LAB**

**Course Code: GR22A1013** **L/T/P/C: 0/0/3/1.5**
**I Year I Semester**

**Course Outcomes:**

1. Compare the behavior of p-n junction diode, Solar cells and LED.
2. Analyze the behavior of magnetic and electric fields with the help of graphs.
3. Infer the work function of a material through photoelectric effect.
4. Discuss the characteristics of Lasers and infer the losses in optical fibers.
5. Estimate the time constant of RC circuit and resonance phenomenon in LCR circuit.

**List of Experiments:**

1. Energy gap of P-N junction diode:To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: To study V-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material and Planck's constant.
7. LASER: To study the V-I characteristics of LASER sources.
8. Optical fiber: To determine the bending losses of Optical fibers.
9. R-C Circuit: To determine the time constant of R-C circuit.
10. LCR Circuit: To determine the resonant frequency and Quality factor of LCR Circuit in series and parallel.

**Note: Any 8 experiments are to be performed.**

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# PROGRAMMING FOR PROBLEM SOLVING LAB

**Course Code: GR22A1017** **L/T/P/C: 0/0/3/1.5**
**I Year I Semester**

**Course Outcomes:**

1. Translate algorithms into a working program and analyse and debug the codesusing basics of C language.
2. Develop programs by choosing appropriate control structures.
3. Select and apply the concept of arrays and strings for problem solving.
4. Demonstrate problem solving using modular programming and pointers.
5. Solve the problems using structures, files and pre-processor directives.

**TASK 1**

a. Write a C program to convert days into years, weeks and days.(Assume a year has 365 days).
b. Write a C program to find greatest and smallest among three numbers using conditional operator.
c. Write a C program to enter P, T, R and calculate Compound Interest.

**TASK 2**

a. Write a C program to swap two numbers using the following.
   (i) Using third variable.
   (ii) Without using third variable.(iii)Using bitwise operators.
b. Write a C program to do the following using Implicit and Explicit type conversion.
   (i) Convert Celsius temperature to Fahrenheit.
   (ii)Convert Fahrenheit temperature to Celsius.
   (iii)Find area of a triangle given sides a,b,c.

**TASK 3**

a. Write a C program to add two numbers without using arithmetic operators in C.
b. Write a C program to determine whether a number is a power of 2 or not using bitwise operator and ternary operator.
c. Write a C program to check whether a number is even or odd using bitwise operatorand ternary operator.

**TASK 4**

a. Write a C program to find the roots of a quadratic equation using if-else.
b. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:For first 50 units Rs. 0.50/unit For next 100 units Rs. 0.75/unitFor next 100 units Rs. 1.20/unitFor unit above 250 Rs. 1.50/unitAn additional surcharge of 20% is added to the bill
c. Write a menu driven C program to implement a simple arithmetic calculator.
d. Write a C program to display number of days in month using switch case (The input is month number 1 -12).

**TASK 5**

a. Write a C Program check whether a given number is Perfect number or not.
b. Write a C Program check whether a given number is Palindrome number or not.

c. Write a C Program check whether a given number is Armstrong number or not.

d. Write a C Program check whether a given number is Strong number or not.

**TASK 6**

a. Write a C program to display the following patterns.

(i)

```
* * * *
*     *
*     *
* * * *
```

(ii)

```
        1
      2   3
    4   5   6
  7   8   9   10
```

(iii)

```
1
2 2
3 3 3
4 4 4 4
```

b. Write a C program to generate the prime numbers between x and y where x and y are starting and ending values to be supplied by the user.

c. Write a C program to calculate the Sum of following series:

(i) $S1=1+x/1!-x^2/2!+x^3/3!-x^4/4!+.....xn/n!$

(ii) $S2= x^1/1+x^3/3+x^5/5+....+x^n/n$

**TASK 7**

a. Write a C program to find sum, average and minimum and maximum in a list of numbers.

b. Write a C program to implement Linear search.

c. Write a C program to implement Binary search.

**TASK 8**

a. Write a C program to implement Matrix Addition.

b. Write a C program to implement Matrix Multiplication.

**TASK 9**

a. Write a C program to implement the following with and without string functions.
(i) Reverse a String (ii) Concatenate 2 Strings.

b. Write a C program to read a string and determine whether it is palindrome or not.

c. Write a C program to sort the 'n' strings in the alphabetical order.

**TASK 10**

a. Write a C program to display binary equivalent of a given decimal number using functions.

b. Write a C program to implement transpose of a matrix using functions

c. Write a C program using functions that compares two strings to see whether they are identical or not. The function returns 1 if they are identical, 0 otherwise.

**TASK 11**

a. Write a C program to implement factorial of a given integer using recursive and non-recursive functions.

b. Write a C program to find the GCD (greatest common divisor) of two given integers using recursive and non-recursive functions.
c. Write a C program to print first 'n' terms of Fibonacci series using recursive and non-recursive functions.

**TASK 12**

a. Write a C program to implement function pointer to find sum and product of two numbers.
b. Write a C program to sort list of numbers using pointers.

**TASK 13**

a. Define a structure student, to tore the following data about a student: rollno(int),name(string) and marks. Suppose that the class has 'n' students. Use array of type student and create a function to read the students data into the array. Your program should be menu driven that contains the following options :
   (i) Print all student details.
   (ii) Search student by rollno.
   (iii) Print the names of the students having the highest test score.
b. Write a C program that uses structures and functions to perform addition and product oftwo complex numbers? (use structures and functions)

**TASK 14**

a. Write a C program to merge two files into a third file.
b. Write a C program to count number of characters in a file and also convert all lowercase characters to upper case and display it
c. Write a C program to append a file and display it.

**TASK 15**

a. Write a C program to find sum of n numbers using command line arguments.
b. Write a C program to implement following pre-processor directives
   i.define ii.undef iii.ifdef iv.ifndef.
c. Write a C program to create a user defined header file to find sum, product and greatestof two numbers.

**Text Books:**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, CengageLearning, ($3^{rd}$ Edition)

**Reference Books:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2. R.G. Dromey, How to solve it by Computer, Pearson ($16^{th}$ Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB**

**Course Code: GR22A1016** **L/T/P/C : 0/0/2/1**
**I Year I Semester**

**Course Outcomes:**

1. Interpret the role and importance of various forms of communication skills.
2. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.
3. Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
4. Recognize the need to work in teams with appropriate ethical, social and professional responsibilities.
5. speak and pronounce English intelligibly

**English Language and Communication Skills Lab (ELCS) shall have two parts:**

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

**Exercise I CALL Lab:**

**Understand:** Introduction to Phonetics – Speech Sounds – Consonant and Vowel Sounds.
**Practice:** Introduction to Phonetics – Speech Sounds – Vowels and Consonants.
**ICS Lab**:

**Understand**: Ice Breaking and JAM.
**Practice**: Ice-Breaking Activity and JAM Session. Introducing oneself and others

**Exercise II CALL Lab**:

**Understand:** Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Formsin Context.
**Practice:** Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.
**ICS Lab**:

**Understand**: Features of Good Conversation – Non-verbal Communication.
**Practice**: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions- Telephone Etiquette

**Exercise III**

**CALL Lab:** Errors in Pronunciation-the Influence of Mother Tongue (MTI).
**Understand**: Intonation--Errors in Pronunciation-the Influence of Mother Tongue (MTI).
**Practice**: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.
**ICS Lab:**
**Understand**: Debates- argumentative vs persuasive - Public Speaking – Exposure to Structured Talks.
Practice: Debates- Making a Short Speech – Extempore.

**Exercise IVCALL Lab**:

**Understand**: Presentation Skills – Elements of Presentation – Organizing Content – Use ofPower Point – Slides Preparation

**Practice**: Presentation Skills
**ICS Lab**:

**Understand:** How to make informal and Formal Presentations
**Practice**: Collages / Poster Presentations-Power point presentations

**Exercise V CALL Lab:**

**Understand:** Listening Skills and its importance-– Purpose- Process- Types- Barriers of Listening - Listening for General/Specific Details.
**Practice**: Listening Comprehension Tests.

**ICS Lab**:

**Understand**: Mind map - Story Telling - Narrating a story using mind maps
**Practice**: Weaving Stories

**Minimum Requirement of infrastructural facilities for ELCS Lab:**

1. **Computer Assisted Language Learning (CALL) Lab**
i) **Interactive Communication Skills (ICS) Lab**

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DESIGN THINKING

**Course Code: GR22A1022** **L/T/P/C: 2/0/0/0**
**I Year I Semester**

**Course Outcomes**

1. To find various DT mindsets
2. Students will be able to extend DT methodology towards defining the problem
3. Students will be able to Identify Tools for Innovation
4. Students will be able to develop Empathy Maps
5. Students will be able to build Prototypes

**UNIT I**

Introduction to Design Thinking: LRI Assessment, Introduction to Design Thinking, Understanding the Mindsets-Empathy, Optimism, Embrace Ambiguity, Make it, Learn from Failure, Iterate, Create Confidence, Creativity Convergent & Divergent Thinking

**UNIT II**

Design Thinking Methodology: The 5 Stages of the Design Thinking Process- Empathise, Define (the problem), Ideate, Prototype, and Test,

**UNIT III**

Ideation tools & exercises. Sample Design Challenge, Design Challenge Themes, Story telling and Tools for Innovation and creativity.

**UNIT IV**

Empathize-Understand customers, Empathy Maps, Empathise-Step into customers shoes-Customer Journey Maps, Define- Analysis & Drawing Inferences from Research

**UNIT V**

The Design Challenge: Define the Design Challenge, Prototyping & Iteration- Feasibility Study,Testing-Documentation and the Pitching

**Textbook:**

1. Design Thinking for Strategic Innovation: What They Can't Teach You at Business or DesignSchool - Idris Mootee.

**Reference Books:**

1. Zero to One: Note on Start-Ups, or How to Build the Future
2. The Lean Startup: How Constant Innovation Creates Radically Successful Businesses
3. Start With Why: How Great LeadersInspireEveryone ToTakeAction

# I YEAR
# II SEMESTER

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

**Course Code: GR22A1002** **L/T/P/C: 3/1/0/4**
**I Year II Semester**

**Course Outcomes**

1. Classify the differential equations of first order and solve them analytically
2. Solve linear differential equations of higher order under various forcing functions
3. Evaluate double and triple integrals and apply them to some problems in geometry
4. Apply principles of vector differentiation and line integration for some field related problems
5. Apply classical vector integral theorems for fast evaluation of work done around closed curves and flux across closed surfaces

**UNIT I**

**ORDINARY DIFFERENTIAL EQUATIONS OF THE FIRST ORDER**

Linear Differential Equations of the first order: Solution of Exact, Linear and Bernoulli equations, modelling Newton's law of cooling, growth and decay models, modelling of R-L circuit

**UNIT II**

**ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**

Solution of homogeneous and non-homogeneous linear differential equations with constant coefficients, complimentary functions, particular integrals and the method of variation of parameters

Solution of Linear Differential Equations with variable coefficients: Cauchy's and Legendre's homogeneous equations

**UNIT III**

**MULTIPLE INTEGRALS**

Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates)

Triple Integrals: Evaluation of triple integrals, Change of variables (Cartesian toSpherical and Cylindrical polar coordinates)

Application of double integral to find the area of a lamina and volume of a solid, application of the triple integral to find the volume of a solid

**UNIT IV**

**VECTOR DIFFERENTIATION AND LINE INTEGRATION**

Vector differentiation:Scalar and vector point functions, Concepts of gradient,divergence and curl of functions in Cartesian framework, solenoidal field, irrotational field, scalar potential

Vector line integration: Evaluation of the line integral, concept of work done by a force field, Conservative fields

**UNIT**

**SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS**

Surface integration: Evaluation of surface and volume integrals, flux across a surface Vector integral theorems: Green's, Gauss and Stokes theorems (without proof) and their applications

**Text Books:**

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosapublishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley& Sons, 2006
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson, Reprint, 2002.

**Reference Books:**

1. GRIET reference manual
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. Calculus Early Transcendental 9E by James Steward, Daniel Clegg, Saleem Watson, CENGAGE Publications

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## ENGINEERING CHEMISTRY

**Course Code: GR22A1005** **L/T/P/C: 3/1/0/4**
**I Year II Semesters**

**Course Outcomes:**

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
3. Recognize various problems related to electrochemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in engineering.
4. Know the origin of different types of engineering materials used in modern technology and interpret different problems involved in industrial utilization of water.
5. Understand the processing of fossil fuels for the effective utilization of chemical energy.

**UNIT I**

**Atomic and Molecular Structure**

Atomic and Molecular orbitals - Definition, examples and comparison, Molecular orbital theory- postulates and MO energy diagrams of $N_2$ and $O_2$.

Theories of Metallic bonding – Free electron theory, Resonance theory, Molecular orbital theory, Valence Bond Theory – Postulates and Limitations, Bonding in $[Ni(CO)_4]$, $[Ni(Cl)_4]^{2-}$, $[Ni(CN)_4]^{2-}$, $[Co(NH_3)_6]^{3+}$, and $[CoF_6]^{3-}$. Crystal Field Theory, Crystal Field Splitting oftransition metal ion d-orbitals in octahedral, tetrahedral and square planar geometries.

**UNIT II**

**Spectroscopic Techniques and Applications**

Regions of Electromagnetic spectrum. Molecular spectroscopy: Rotational Spectroscopy: Rotation of molecules, Rotational spectra of rigid diatomic molecules, Selection rules.
Vibrational Spectroscopy: The vibrating diatomic molecule, Simple and anharmonic oscillators of a diatomic molecule, Selection rules, Applications of IR spectroscopy.

NMR Spectroscopy: Criteria for NMR activity (Magnetic and non-magnetic nuclei), Basic concepts and Principle of $^1H$ NMR spectroscopy, Chemical shift- Shielding and Deshielding. Magnetic Resonance Imaging.

**UNIT III**

**Batteries and Corrosion**

Batteries: Primary and Secondary types, Lithium ion and Lead acid batteries. Fuel cells: Definition, Hydrogen-Oxygen fuel cell and Microbial Fuel cell – working principle and applications.Corrosion: Definition, causes and effects of corrosion, Theories of chemical and electro chemical corrosion with mechanism, Differential metal corrosion - Galvanic corrosion, Differential aeration corrosion - pitting corrosion, Factors affecting corrosion – Nature of metal (Position of metal, Relative areas, Purity and Passivity), Nature of Environment (pH, Temperature and Humidity), Corrosion control methods: Cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping- galvanization and tinning.

**UNIT IV**

**Engineering Materials and Water Technology**

Semiconductors: Si and Ge - preparation, purification and crystal growth by zone refining and Czochralski pulling methods, Doping – Epitaxy, Diffusion and Ion implantation.

Plastics: Comparison between thermoplastics and thermosets, Fabrication of plastics - compression moulding and injection moulding. Conducting polymers – Definition, classification and applications.

Water: Hardness - Causes, types and units. Boiler troubles-scales and sludges, caustic embrittlement. Water purification: Demineralization by Ion-exchange process, Desalination by reverse osmosis method.

**UNIT V**

**Stereochemistry and Energy Resources**

Stereochemistry: Elements of symmetry-plane of symmetry, centre of symmetry, alternating axis of symmetry. Chirality, Enantiomers – tartaric acid, Diastereomers- 2,3-dichloropentane, Conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of aspirin and ibuprofen.

Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Petroleum-its composition, Cracking – Definition, Fluid bed catalytic cracking, Knocking and its mechanism in Internal Combustion engine, Octane rating, Hydrogen gas generation by Electrolysis process.

**Text Books:**

1. Engineering chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Textbook of Engineering Chemistry by A. Jayashree, Wiley Publications

**Reference Books:**

1. Organic Chemistry by Morrison, Boyd & Bhattacharjee (Pearson Pubs)
2. Engineering Chemistry by O.G.Palanna, Tata McGraw Hills Private Ltd.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. McGraw Hill Publication
4. A Textbook of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# FUNDAMENTALS OF ELECTRICAL ENGINEERING

**Course Code: GR22A1008** **L/T/P/C: 2/1/0/3**
**I Year II Semester**

**Course Outcomes**

1. Summarize Understand basic electric circuits.
2. Analyze electric circuits with suitable theorems.
3. Interpret the working principle of Electrical machines.
4. Solve single phase balanced sinusoidal systems.
5. Apply sensors for real time applications

**UNIT I**

**BASIC COMPONENTS AND ELECTRIC CIRCUITS**

Charge, Current, Voltage, Power, Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Delta – star conversion.

**UNIT II**

**NETWORK ANALYSIS**

Nodal and Mesh Analysis, Linearity and Superposition, Thevenin's and Norton's theorems, Maximum power transfer theorem and Reciprocity theorem.

**UNIT III**

**A.C CIRCUITS**

Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor, analysis of RL, RC and RLC circuits. Series and Parallel Circuits, Resonance.

**UNIT IV**

**BASICS OF ELECTRICAL MACHINES**

Transformer: Mutual Induction, construction and working principle, Types of transformers, Ideal transformer, EMF Equation, Phasor diagram on No Load.
Construction and working principles of DC generator, DC motor, Synchronous generator, and Induction Motor – applications.

**UNIT V:**

**MEASURING INSTRUMENTS AND SENSORS**

Transducers, Sensors, and Actuators – Physical Principles and their working Temperature Sensors, Ultrasonic Sensor, Accelerometers Sensor and PIR Motion Detector.

**Text Books:**

1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering -, Third edition 2010, Tata McGraw Hill.
2. Sensors and amp, Transducers – D. Patranabis, PHI Publications
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice HallIndia, 1989

**Reference Books:**

1. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw HillEducation,2004.
2. K. V. V. Murthy and M. S. Kamath, “Basic Circuit Analysis”, Jaico Publishers, 1999.
3. Circuit Theory (Analysis and Synthesis) by A.Chakrabarti-Dhanpat Rai & Co.
4. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
5. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
6. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# DATA STRUCTURES

**Course Code: GR22A1012** **L/T/P/C:2/1/0/3**
**I Year II Semester**

**Course Outcomes:**

1. Implement various sorting techniques and analyze the computational complexityof algorithms.
2. Analyze the basics of data structures and its types and translate to programsthe operations on Stack and Queue and their applications.
3. Develop algorithms for various operations on linked lists and convert them to programs.
4. Interpret operations on non-linear data structure Binary tree and BST.
5. Summarize the operations on graphs and apply graph traversals techniques andoutline hashing techniques.

**UNIT I**

**Sorting:** Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Radix Sort, Counting sort.

**Algorithms:** Analysis of algorithms, Basic concept of order of complexity, Asymptotic Notations: Big Oh notation, Omega notation, Theta notation, little oh notation and little omeganotation.

**UNIT II**

**Stacks:** Introduction to Data Structures and types, Stack – Operations: pop, push, display, peek, Representation and Implementation of stack operations using Arrays, Stack Applications, Recursion, In -fix- to postfix Transformation, Evaluating Post-fix Expressions.

**Queues:** Queue – Operations: Enqueue, Dequeue, display, Representation and Implementation of Queue operations using array, Applications of Queues, Circular Queues - Representation andImplementation.

**UNIT III**

**LIST:** Introduction, Dynamic memory allocation, Self-referential structures ,single linked list, Advantages and disadvantages of single linked list ,single linked list VS Arrays, representation of a linked list in memory, Operations-insertion, deletion, display, search, Implementation of stack, queue using linked list. Circular linked list, Double linked list.

**UNIT IV**

**TREES:** Basic tree concepts, **Binary Trees:** Properties, types, Representation of Binary Trees using arrays and linked lists, Binary Search Tree –Representation and Implementation of operations, Binary Search Tree Traversals (recursive), Creation of binary tree and BST from given traversals.

**UNIT V**

**Graphs:** Definition, Basic Terminology, Representation of Graphs, Graph Traversal Techniques –Breadth First Traversal, Depth First Traversal. Introduction to Hashing techniquesand examples (no implementation).

**Text Books:**

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH

**Reference Books:**

1. Data Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis , Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed,University Press

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## ENGINEERING CHEMISTRY LAB

**Course Code: GR22A1015** **L/T/P/C:0/ 0/3/1.5**
**I Year II Semester**

**Course Outcomes:**

1. Ability to perform experiments illustrating the principles of chemistry relevant to thestudy of science and engineering.
2. Determination of parameters like hardness and chloride content in water, measurementof redox potentials and conductance.
3. Understand the kinetics of a reactions from a change in concentrations of reactants or products as a function of time.
4. Synthesize a drug molecule as an example of organic synthesis methods widely used in industry.
5. Determination of physical properties like adsorption and viscosity.

**List of Experiments:**

1. Determination of Total Hardness of water by complexometric method using EDTA
2. Determination of Chloride content of water by Argentometry
3. Redox titration: Estimation of Ferrous ion using standard KMnO4 by Permanganometry
4. Estimation of HCl by Conductometric titrations
5. Estimation of Ferrous ion by Potentiometry using dichromate
6. Determination of Rate constant of acid catalyzed reaction of methyl acetate
7. Adsorption of Acetic acid by charcoal
8. Determination of Surface tension of liquid by using Stalagmometer
9. Determination of Viscosity of liquid by using Ostwald's Viscometer
10. Determination of Partition Coefficient of Acetic acid between n-butanol and water
11. Synthesis of Aspirin
12. Synthesis of Paracetamol

**Reference Books:**

1. Vogel's text book of Practical organic chemistry, 5th Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand & Co., Delhi)
3. Text book on experiments and Calculations in Engineering Chemistry-S.S.Dara.
4. An introduction to practical chemistry, K.K. Sharma and D.S. Sharma (VikasPublications, New Delhi)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**FUNDAMENTALS OF ELECTRICAL ENGINEERING LAB**

**Course Code: GR22A1019** **L/T/P/C: 0/0/2/1**
**I Year II Semester**

**Course Outcomes:**

1. Get an exposure to common electrical components and their ratings.
2. Get an exposure to basic electrical laws.
3. Understand the measurement and relation between the basic electrical parameters
4. Understand the response of different types of electrical circuits to different excitations.
5. Compare the basic characteristics of Electrical machines

**TASK-1**

Verification of Ohms Law, KVL and KCL

**TASK-2**

Verification of Thevenin's and Norton's Theorems

**TASK-3**

Verification of Superposition and Reciprocity Theorems.

**TASK-4**

Verification of Maximum Power Transfer Theorem

**TASK-5**

Resonance in series RLC circuit

**TASK-6**

Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

**TASK-7**

Three Phase Transformer: Verification of Relationship between Voltages andCurrents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

**TASK-8**

Measurement of Active and Reactive Power in a balanced Three-phase circuit

**TASK-9**

Torque Speed Characteristics of a Separately Excited DC Shunt Motor

**TASK-10**

Torque-Slip Characteristics of a Three-phase Induction Motor

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DATA STRUCTURES LAB

**Course Code: GR22A1020** **L/T/P/C:0/0/2/1**
**I Year II Semester**

**Course Outcomes:**
1. Construct executable C programs for sorting techniques.
2. Implement stack and queue data structures and their applications.
3. Interpret various linked list operations to produce executable codes.
4. Develop working procedure for operations on BST using DMA.
5. Demonstrate graph representations and graph traversal techniques

**TASK 1**

a. Implement Bubble sort using a C program.
b. Implement Selection sort using a C program.
c. Implement Insertion Sort using a C program.

**TASK 2**

a. Develop a C program for Quick sort.
b. Demonstrate Merge sort using a C program.
c. Design a C program for Radix Sort.

**TASK 3**

a. Write a C program to implement Stack operations using arrays.
b. Write a C program to implement Queue operations using arrays.
c. Write a C program to implement Circular Queue operations using arrays

**TASK 4**

a. Write a c program to convert Infix expression to postfix expression.
b. Write a c program to evaluate a Postfix expression.

**TASK 5**

a. Write a C program to check for balanced parenthesis.
b. Implement a C program for Stack using Linked list.
c. Implement a C program for Queue using Linked list.

**TASK 6**

a. Implement the following operations on Single Linked List using a C program.
   i. create
   ii insert
   iii delete
   iv search
   v display

**TASK 7**

a. Write a C program to implement Circular Linked List operations – create, insert, deleteand display.

**TASK 8**

a. Write a C program to implement Double Linked List operations – create, insert, delete and display.

**TASK 9**

a. Implement the following operations on Binary Search Tree
   i. Create
   ii. insert
   iii. search
   iv. delete
   v. count-nodes
   vi. Height.
   vii. Minimum node.
   viii. Maximum node.

**TASK 10**

a. Develop a C code for Preorder, Inorder and Postorder traversals of a Binary SearchTree
b. using recursion.
c. Design a C program for Level order traversal of a Binary Search Tree.

**TASK 11**

a. Write a C program to implement Adjacency Matrix of a given Graph
b. Write a C program to implement Adjacency List of a given Graph

**TASK 12**

a. Implement a C program for DFS traversal on graph.
b. Implement a C program for BFS traversal on graph.

**Teaching methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books:**

1. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
2. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH

**References:**

1. Data Structure with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# ENGINEERING WORKSHOP

**Course Code: GR22A1021** **L/T/P/C: 1/0/3/2.5**
**I Year II Semester**

**Course Outcomes**

1. Develop various trades applicable to industries / Manufacturing practices.
2. Create Hands on experience for common trades.
3. Improve to fabricate components with their own hands.
4. Develop practical knowledge on the dimensional accuracies and dimensionaltolerances possible with various manufacturing processes.
5. To build the requirement of quality of work life on safety and organizational needs.

**TRADES FOR EXERCISES: At least two exercises from each trade:**

1. Carpentry
2. Fitting Shop
3. Tin-Smithy
4. Casting
5. Welding Practice
6. House-wiring
7. Black Smithy
8. **VIDEO LECTURES**: Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

**Text Books:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal /Anuradha.

**References:**

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/SciTech
2. Workshop Manual / Venkat Reddy/BSP
3. Workshop Manual/K. Venugopal/Dr.V. Prabhu Raja/G.Sreekanjan

# II YEAR
# I SEMESTER

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DIGITAL LOGIC DESIGN

**Course Code: GR22A2067** **L/T/P/C: 3/0/0/3**
**II Year I Semester**

**Course Outcomes**:
1. Apply knowledge of fundamental Boolean principles and manipulation to designLogic Circuits.
2. Apply various techniques of Boolean function simplification to create minimal expressions.
3. Create combinational circuits for a specified behavior with minimal specification.
4. Synthesize Sequential circuits with minimal states.
5. Realize combinational circuitry using Combinational PLDs and develop & test HDL models of Logic Circuits.

**UNIT I**

**Binary Systems**: Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.
**Boolean Algebra And Logic Gates**: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

**UNIT II**

**Gate-Level Minimization**: The Map method, Four-variable map, Five-variable map, Product of Sum's simplifications, Don't care conditions, NAND and NOR implementation, other two level implementations, Exclusive-OR Function.

**UNIT III**

**Combinational Logic**: Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

**UNIT IV**

**Synchronous Sequential Logic**: Sequential Circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design Procedure.

**Registers and Counters:** Registers, Shift registers, Ripple Counters, Synchronous Counters, other counters.

**UNIT V**

**Memory and Programmable Logic**: Introduction, Random Access Memory, Memory decoding, Error detection and correction, Read only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices.
**Hardware Description Language:** Hardware Description Language, Definition, Structural Definition of HDL, HDL models for Combinational circuits, HDL for models for Sequential circuits.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books:**

1. Digital Design with an Introduction to the Verilog HDL – Fifth Edition, M. Morris Mano, Pearson Education.
2. Fundamentals of Logic Design – Roth, 7th Edition, Thomson.

**References:**

1. Switching and Finite Automata Theory by ZviKohavi, Tata Mc Graw Hill.
2. Switching and Logic Design – CVS Rao, Pearson Education
3. Digital Principles and Design – Donald D.Givone, Tata Mc Graw Hill.
4. Fundamentals of Digital Logic and MicroComputer Design,5thEdition,M.Rafiquzzaman (John Willey)

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## JAVA PROGRAMMING

**Course Code: GR22A2068** **L/T/P/C: 3/0/0/3**
**II Year I Semester**

**Course Outcomes:**
1. Identify the model of Object-Oriented Programming: Abstract data types, Encapsulation, Inheritance and Polymorphism.
2. Summarize the fundamental features like Interfaces, Exceptions and Collections.
3. Correlate the advantages of multi-threading.
4. Design interactive programs using Applets, AWT and Swings.
5. Develop real time applications using the features of Java.

**UNIT I**

**Object Oriented Thinking:** Introduction, Need of object-oriented programming, principles of object-oriented languages, Applications of OOP, history of JAVA, Java Virtual Machine, Java features, Program structures, Installation of JDK.

Variables, Primitive data types, Identifiers- Naming Conventions, Keywords, Literals, Operators- Binary, Unary and Ternary, Expressions, Primitive Type conversion and casting, flow of control- branching, conditional, loops.

**UNIT II**

**CLASSES, INHERITANCE, POLYMORPHISM:**

**Classes and Objects:** Classes, Objects, creating objects, methods, constructors- constructor overloading, cleaning up unused objects- Garbage collector, class variable and methods- static keyword, this keyword, arrays, Command linearguments, Nested Classes

**Strings:** String, StringBuffer, StringTokenizer

**Inheritance and Polymorphism:** Types of Inheritance, deriving classes using extends keyword, super keyword, Polymorphism – Method Overloading, Method Overriding, final keyword, abstract classes.

**UNIT III**

**INTERFACES, PACKAGES, EXCEPTIONS**

**Interfaces:** Interface, Extending interface, interface Vs Abstract classes.

**Packages:** Creating Packages, using Packages, Access protection, java I/O package. Exceptions - Introduction, **Exception handling Techniques:** try…catch, throw, throws, finally block, user defined Exception.

**UNIT IV**

**MULTI-THREADING, COLLECTIONS**

java.lang.Thread, the main Thread, creation of new Threads, Thread priority, multithreading- using isalive() and join(), Synchronization, suspending and resuming Threads, Communication between Threads.Exploring java.io, Exploring java.util

**Collections:** Overview of Collection Framework : ArrayList, LinkedList, Vector, HastSet, TreeSet, HashMap, HashTable, TreeMap, Iterator, Comparator

**UNIT V**

**APPLETS, AWT AND SWINGS**

Applet class, Applet structure, an example Applet program, Applet life cycle.

**Abstract Window Toolkit:** Why AWT?java.awt package, components and containers, Button, Label, Checkbox, Radio buttons, List boxes, choice boxes, Text field and Text area, container classes, Layout Managers.

**Event Handling:**Introduction, Event Delegation Model, Java.awt.event Description, Adapter classes, Innerclasses.

**Swing:** Introduction, JFrame, JApplet, JPanel, Components in swings, JList and JScroll Pane, Split Pane, JTabbed Pane, Dialog Box, Pluggable Look andfeel.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books/ References:**

1. Java: The Complete Reference, 10thedition, Herbert Schildt, McgrawHill.
2. Java Fundamentals: A Comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH.
3. Java for Programming, P.J.DietelPearsonEducation
4. Object Oriented Programming through Java, P.Radha Krishna, Universities Press.
5. Thinking in Java, Bruce Eckel, PearsonEducation
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DISCRETE MATHEMATICS

**Course Code: GR22A2075** **L/T/P/C: 2/1/0/3**
**II Year I Semester**

**Course Outcomes**:
1. Use propositional and predicate logic in knowledge representation and truthverification.
2. Demonstrate the application of discrete structures in different fields of computerscience.
3. Apply basic and advanced principles of counting to the real-world problems.
4. Able to formulate the problem and solve using recurrence relations and generating functions.
5. Devise the given problem as a graph network and solve with techniques of graphtheory.

**UNIT I**

**Mathematical Logic:** Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms.
**Predicates:** Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction.

**UNIT II**

**Set Theory:** Properties of binary Relations, equivalence, compatibility and partial ordering relations, Hasse diagram.
**Functions:** Inverse Function Composite of functions, recursive Functions, Lattice and its Properties, Pigeon hole principle and its application.
**Algebraic Structures:** Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups' homomorphism, Isomorphism.

**UNIT III**

**Elementary Combinatorics:** Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion.

**UNIT IV**

**Recurrence Relation:** Generating Functions, Function of Sequences Calculating Coefficient of generating function, Recurrence relations, solving recurrence relation by substitution and Generating funds, Characteristics roots, solution of Inhomogeneous Recurrence Relation.

**UNIT V**

**Graph Theory:** Representation of Graph, Depth First Search, Breadth First Search, Spanning Trees, planar Graphs, Graph Theory and Applications, Basic Concepts Isomorphism and Sub graphs, Multi graphs and Euler circuits, Hamiltonian graphs, Chromatic Numbers.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books/ References:**

1. Discrete and Combinational Mathematics- An Applied Introduction-5thEdition– Ralph.P.Grimaldi.PearsonEducation
2. Discrete Mathematical Structures with applications to computer scienceTrembly J.P. &Manohar.P,TMH
3. Mathematical Foundations for ComputerScienceEngineers,JayantGanguly,Pearson Education
4. Discrete Mathematics and its Applications, Kenneth H. Rosen,FifthEdition.TMH.
5. Discrete Mathematics with Applications, ThomasKoshy,Elsevier
6. Discrete Mathematical Structures, BernandKolman, Roberty C. Busby, SharnCutter Ross, Pearson

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## ECONOMICS AND ACCOUNTING FOR ENGINEERS

**Course Code: GR22A2004** **L/T/P/C: 3/0/0/3**
**II Year I Semester**

**Course Outcomes**:

1. The student will be able to understand the concepts of economics and Demandconcepts, elasticity, and techniques for forecast demand of products
2. The student will be able to plan the production levels in tune with maximumutilization of organizational resources and with maximum profitability.
3. To understand the types of markets, types of competition and to estimate the cost of products and decide the price of the products and services produced
4. The student will be able to analyze the profitability of various projects using capital budgeting techniques and
5. The student is able will be able prepare the financial statements and more emphasis on preparation of final accounts.

**UNIT-I**

**Introduction & Demand Analysis:** ***Definition and Scope:*** Introduction to micro, macroeconomics, Nature, and Scope of Managerial Economics. National Income and its Components - GNP, NNP, GDP, NDP ***Demand Analysis***: Demand Determinants, Law of Demand, and its exceptions. ***Elasticity of Demand***: Definition, Types, Measurement and Significance of Elasticity of Demand. ***Demand Forecasting***, Factors governing demand forecasting, methods of demand forecasting,

**UNIT II**

**Production & Cost Analysis:** ***Production Function*** – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. ***Cost Analysis*:** Cost concepts. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

**UNIT III**

**Markets and Forms of Business organizations:** Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. ***Pricing*:** Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises, and their types.

**UNIT-IV**

**Capital Budgeting:** Capital and its significance, Types of Capital, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value (NPV) Method and Internal Rate of Return (IRR) (simple problems) and Profitability Index (PI)

**UNIT-V**

**Introduction to Financial Accounting: Accounting Concepts and Conventions** - Double-Entry Bookkeeping. **Accounting Cycle:** Journal, Ledger, Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**Text Books**

1. Managerial Economics – International Edition, 2019, by Christopher Thomas(Author), S. Charles Maurice (Author), McGraw-Hill Education
2. Managerial Economics Aryasri: Managerial Economics and Financial Analysis,TMH, 2009.
3. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13.Publisher, Sultan Chand, 2007.
4. Financial Accounting Paperback–2016by K.L.Narang S.P.Jain, KalyaniPublishers,2005.

**Reference Books**

1. Managerial Economics 4th Edition , W. Cris Lewis, Sudhir K. Jain, H. CraigPetersen, Pearson, 2009
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2009
3. Financial Accounting, 6/e, Dr S N Maheshwari, CA Sharad K Maheshwari & DrSuneel K Maheshwari, Vikas Publishing, 2018

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DATABASE MANAGEMENT SYSTEMS

**Course Code: GR22A2069** **L/T/P/C: 3/0/0/3**
**II Year I Semester**

**Course Outcomes**:
1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications and apply indexing techniques.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

**UNIT I**

**Introduction to Database And System Architecture:** Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages-DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

**Introduction to Database Design:** ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

**UNIT II**

**SQL Queries and Constraints:** SQL Data Definition, Types of SQL Commands,Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying / Altering Tables and Views, Cursors, Triggers and Active Databases.

**UNIT III**

**Relational Model:** Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra and Relational Calculus.

**Storage and Indexing:** File Organizations and Indexing-Overview of Indexes, Types of Indexes, Index Data Structures, Tree structured Indexing, Hash based Indexing.

**UNIT IV**

**Schema Refinement and Normal Forms:** Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD, Normal Forms, Properties of Decomposition.

**UNIT V**

**Transaction Management:** Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability.

**Concurrency Control:** Lock based Protocols, Timestamp based protocols,

**Recovery System:** Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer Management.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books/ References:**

1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke,TATA McGraw Hill 3rdEdition
2. "Data base System Concepts", Silberschatz, Korth, McGraw hill, V Edition.
3. "Introduction to Database Systems", C.J.DatePearsonEducation.
4. "Database Systems design, Implementation, and Management", Rob & Coronel5thEdition.
5. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.
6. "Database Management System", ElmasriNavate, PearsonEducation.
7. "Database Management System", Mathew Leon,Leo

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## SCRIPTING LANGUAGES LAB

**Course Code: GR22A2085** **L/T/P/C: 0/0/3/1.5**
**II Year I Semester**

**Course Outcomes:**
1. Design JavaScript and python applications for day to day activities.
2. Implement web application using PHP.
3. Design, debug and run complete web applications using PHP and MYSQL.
4. Build web applications using JavaScript and AJAX programming.
5. Develop web application to retrieve data from database using AJAX.

**TASK 1**

a. Write a JavaScript code to edit a paragraph text on a button click.
b. Insert an image in HTML page using image tag. Define a JavaScript code to change image on a button click.

**TASK 2**

a. Write a JavaScript Code to check whether given number is positive, negative or zero
b. Write a JavaScript Code to check whether given number is palindrome or not

**TASK 3**

Design a simple multiplication table using JavaScript asking the user the number of rows and columns as user wants to print.

**TASK 4**

Create a sample form program that collects the first name, last name, user id, and password and confirms password from the user. All the inputs are mandatory. Also, the values entered in the password and confirm password textboxes should be the same. After validating using JavaScript, Report error messages in red color just next to the textbox where there is an error.

**TASK 5**

a. Write a Python Code to find GCD of given numbers
b. Write a Python Code to check whether given number is prime or not
c. Write a Python Code to generate Fibonacci series upto limit ‘n’

**TASK 6**

**a.** Write a Python Code to count the number of odd and even numbers in a given list of numbers
**b.** Write a Python Code to find the largest number in the given list
**c.** Write a Python Code to reverse a given list

**TASK 7**

a. Write a Python program that will prompt the user for a file name, read all the linesfrom the file into a list, sort the list, and then print the lines in sorted order.
b. Write a Python program that asks the user for a filename, and then prints the numberof characters, words, and lines in the file.

**TASK 8**

Implement PHP script for the following.

a. Find the factorial of a number (while loop)
b. To reverse the digit (Use do while)
c. Find the sum of the digits (Use for loop)
d. Write a PHP script for the following: Design a form to accept the details of 5different items, such as item code, item name, units sold, and rate. Display the bill in the tabular format. Use only 4 text boxes. (Hint: Use of explode function.)

**TASK 9**

**a.** Assume an array with different values. Write a PHP script to print only unique values from the array.
**b.** Write a PHP script for finding sum of array elements
**c.** Write a PHP script for searching an element in an array using linear search

**TASK 10**

a. Examine and write a PHP script for creating required student information in the database.
b. Write a PHP script for deleting and updating a specified student from the database.

**TASK 11**

Create a simple XMLHttpRequest and retrieve data from a text file.

**TASK 12**

Develop a AJAX application to retrieve the contents of database.
Example: Consider a webpage with a dropdown list of set of names, as user selects a name the application should be able to display selected user information ( username, Phone number, Email-id, Place) in a table. When user selects other name, other user information should be displayed without reloading the page.

**Text Books/ References:**

1. Introduction to Programming using Python, Y.Daniel Liang, Pearson.
2. Beginning PHP and MySQL 3rd Edition W. Jason Gilmoren - Third Edition, Apress publications
3. Beginning JavaScript with DOM scripting and AJAX: From Novice to Professionalby Christian Heilman

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## JAVA PROGRAMMING LAB

**Course Code: GR22A2071** **L/T/P/C: 0/0/4/2**
**II Year I Semester**

**Course Outcomes**:
1. Analyze a problem, identify and define the computing requirements appropriate to its solution using object-oriented programming concepts.
2. Design the applications using Inheritance, Polymorphism and Synchronizationconcepts.
3. Handle exceptions at Compile time and Run time.
4. Solve the real-world problems using Java Collection framework.
5. Develop GUI applications using Applets, AWT and Swings.

**TASK 1**

Write java programs that implement the following
a. Constructor
b. Parameterized constructor
c. Method overloading
d. Construct or overloading.

**TASK 2**

a. Write a Java program that checks whether a given string is a palindrome or not. Ex:MADAM is a palindrome.
b. Write a Java program for sorting a given list of names in ascending order.
c. Write a Java Program that reads a line of integers, and then displays each integer and the sum of all the integers (Use StringTokenizer class ofjava.util)

**TASK 3**

Write java programs that uses the following keywords
a) This b)super c)static d)final

**TASK 4**

a. Write a java program to implement method overriding
b. Write a java program to implement dynamic method dispatch.
c. Write a Java program to implement multiple inheritance.
d. Write a java program that uses access specifiers.

**TASK 5**

a. Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
b. Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
c. Write a Java program that displays the number of characters, lines and words in a text file

**TASK 6**

a. Write a Java program for handling Checked Exceptions.
b. Write a Java program for handling Unchecked Exceptions.

**TASK 7**

a. Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
b. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

**TASK 8**

Write a program illustrating following collections framework
a) Array List b) Vector c) Hash Table d) Stack

**TASK 9**

a. Develop an applet that displays a simple message.
b. Develop an applet that receives an integer in one text field and compute its factorial value and return it in another text field, when the button named "Compute" is clicked.
c. Write a Java program that works as a simple calculator. Use a grid layout to arrange button for the digits and for the +, -,*, % operations. Add a text field to display the result.

**TASK 10**

a. Write a Java program for handling mouse events.
b. Write a Java program for handling key events.

**TASK 11**

a. Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields Num1 and Num 2.
b. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1or Num2 were not an integer, the program would throw Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception and display the exception in a message dialog box.

**TASK 12**

a. Write a java program that simulates traffic light. The program lets the user select one of three lights: red, yellow or green. When a radio button is selected, the light is turned on, and only one light can be on at a time. No light is on when the program starts.
b. Write a Java program that allows the user to draw lines, rectangles and ovals.

**TASK 13**

Create a table in Table.txt file such that the first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using JTable component.

**Text Books/ References:**

1. Java: The Complete Reference, 10thedition, Herbert Schildt, McgrawHill.
2. Java Fundamentals- A Comprehensive introduction, Herbert schildtand Dale skrien,TMH.
3. Java for programming, P.J.Dietel Pearson education (OR) Java: How to Program P.J.Dietel and H.M.Dietel,PHI
4. Object Oriented Programming through java, P.Radha Krishna, UniversitiesPress.
5. Thinking in Java, Bruce Eckel, PearsonEducation
6. Programming in Java, S.Malhotra and S.Choudhary, Oxford University Press.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DATABASE MANAGEMENT SYSTEMS LAB

**Course Code: GR22A2072** **L/T/P/C: 0/0/3/1.5**
**II Year I Semester**

**Course Outcomes:**
1. Construct the schema of the database and modify it.
2. Compile a query to obtain the aggregated result from the database.
3. Speculate the concepts of various database objects.
4. Compare the use of procedure and function in database.
5. Use triggers and packages to create applications in the database.

**Task-1:**

DDL commands (Create, Alter, Drop, Truncate)

1. Create a table EMP with the following structure.

| Name | Type |
|---|---|
| EMPNO | NUMBER(6) |
| ENAME | VARCHAR2(20) |
| JOB | VARCHAR2(10) |
| MGR | NUMBER(4) |
| DEPTNO | NUMBER(3) |
| SAL | NUMBER(7,2) |

2. Add a column commission to the emp table. Commission should be numeric with null values allowed.
3. Modify the column width of the job field of emp table.
4. Create dept table with the following structure.

| Name | Type |
|---|---|
| DEPTNO | NUMBER(2) |
| DNAME | VARCHAR2(10) |
| LOC | VARCHAR2(10) |

DEPTNO as the primary key

5. Add constraints to the emptable that is empno as the primary key and deptno as the foreignkey.

6. Add constraints to the emptable to check the empno value while entering(i.e)empno>100.Salary value by default is 5000, otherwise it should accept the values from the user.
7. Add columns DOB to the emp table. Add and drop a column DOJ to the emp table.

**Task-2:** DML COMMANDS (Insert, Update, Delete)

1. Insert 5 records into dept Insert few rows and truncate those from the emp1 table andalso drop it.
2. Insert 11 records into emp table.
3. Update the emp table to set the value of commission of all employees to Rs1000/- whoare workingas managers.
4. Delete only those who are working as supervisors.
5. Delete the rows whose empnois7599.

**Task-3:** TCL COMMANDS (Save Point, Rollback Commit)

**Task-4:** DQL COMMAND (Select)- SQL Operators and Order by Clause

1. List the records in the emp table order by salary in descending order.
2. Display only those employees whose deptnois30.
3. Display deptno from the table employee avoiding the duplicated values.
4. List all employee names, salary and 15% rise in salary. Label the column as pay hike.
5. Display the rows whose salary ranges from 15000 to30000.
6. Display all the employees in dept 10 and 20 in alphabetical order of names.
7. List the employee names who do not earn commission.
8. Display all the details of the records with 5-character names with 'S' as starting character.
9. Display joining date of all employees in the year of1998.
10. List out the employee names whose salary is greater than 5000 and less than6000

**Task-5:** SQL Aggregate Functions, Group By clause, Having clause

1. Count the total records in the emp table.
2. Calculate the total and average salary of the employee.
3. Determine the max and min salary and rename the column as max-salary and min_salary.
4. Find number of departments in employee table.
5. Display job wise sum, average, max, min salaries.
6. Display maximum salaries of all the departments having maximum salary >2000
7. Display job wise sum, avg, max, min salaries in department 10 having average salary is greater than 1000 and the result is ordered by sum of salary in descending order.

**Task-6:** SQL Functions

1. Display the employee name concatenate with employee number.
2. Display half of employee name in upper case and half in lowercase.
3. Display the month name of date "14-jul-09" in full.
4. Display the Date of joining of all employees in the format "dd-mm-yy".
5. Display the date two months after the Date of joining of employees.
6. Display the last date of that month in"05-Oct-09".
7. Display the rounded date in the year format, month format, day format in the employee
8. Display the commissions earned by employees. If they do not earn commission, display it as "NoCommission".

**Task-7:** Nested Queries

1. Find the third highest salary of an employee.
2. Display all employee names and salary whose salary is greater than minimum salary of thecompany and job title starts with 'M'.
3. Write a query to display information about employees who earn more than any employee indept30.
4. Display the employees who have the same job as Jones and whose salary is greater than or equalto the salary of Ford.
5. List out the employee names who get the salary greater than the maximum salaries of dept withdeptno 20,30.
6. Display the maximum salaries of the departments whose maximum salary is greater than 9000.
7. Create a table employee with the same structure as the table emp and insert rows into the tableusing select clauses.
8. Create a manager table from the emp table which should hold details only about the managers.

**Task-8** Joins, Set Operators.

1. Display all the employees and the departments implementing a left outer join.
2. Display the employee name and department name in which they are working implementing a full outer join.
3. Write a query to display their employee names and their managers' name and salary for everyemployee.
4. Write a query to output the name, job, empno, deptname and location for each dept, even if there are no employees.
5. Display the details of those who draw the same salary.

**Task-9:** Views

1. Create a view that displays the employee id, name and salary of employees who belong to10$^{th}$department.
2. Create a view with read only option that displays the employee name and their department name.
3. Display all the views generated.
4. Execute the DML commands on views created and drop them
5. Practices on DCL commands.

**Task-10:**

1. Sequence and Indexes and Table locking
2. Write a PL/SQL code to retrieve the employee name, join date and designation of an employeewhose number is given as input by the user.
3. Write a PL/SQL code to calculate tax of employee.
4. Write a PL/SQL program to display top ten employee details based on salary using cursors.
5. Write a PL/SQL program to update the commission values for all the employees' with salary lessthan 2000, by adding 1000 to the existing values.

**Task-11:**

1. Write a trigger on employee table that shows the old and new values of employee name afterupdating on employee name.

2. Write a PL/SQL procedure for inserting, deleting and updating the employee table.
3. Write a PL/SQL function that accepts the department number and returns the total salary of thatdepartment.

**Task-12:**

1. Write PL/SQL program to handle predefined exceptions.
2. Write PL/SQL program to handle user defined exception.
3. Write a PL/SQL code to create
   a. Package specification
   b. Package body to insert, update, delete and retrieve data on emp table

**Text/Reference Books**

1. The Complete Reference,3rd edition by James R.Groff, Paul N.Weinberg, AndrewJ. Oppel
2. SQL & PL/SQL for Oracle10g, Black Book,Dr.P.S.Deshpande.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## VALUE ETHICS AND GENDER CULTURE

**Course Code: GR22A2002** **L/T/P/C: 2/0/0/0**
**II Year I Semester**

**Course Outcomes**

1. To enable the student to understand the core values that shapes the ethical behaviour. And Student will be able to realize the significance of ethical human conduct and self-development
2. Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.
3. The students will learn the rights and responsibilities as an employee and a team member.
4. Students will attain a finger grasp of how gender discrimination works in our society and how to counter it.
5. Students will develop a better understanding on issues related to gender and Empowering students to understand and respond to gender violence.

**UNIT I**

**Values and Self-Development**–social values and individual attitudes, Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National unity, Patriotism, Love for nature, Discipline.

❖ A Case study on values and self-development

**UNIT II**

**Personality and Behaviour Development**-positive thinking, punctuality, avoiding fault finding, Free from anger, Dignity of labour, religious tolerance, Aware of self-destructive habits.

❖ A Case study on Personality

**UNIT III**

**Introduction to Professional Ethics**: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

❖ A Case study on professional ethics

**UNIT IV**

**Introduction to Gender** - Definition of Gender, Basic Gender Concepts and Terminology, Attitudes towards Gender, Social Construction of Gender.

❖ A Case study/ video discussion on attitudes towards gender

**UNIT V**

**Gender-based Violence** -The concept of violence, Types of Gender-based violence, the relationship between gender, development and violence, Gender-based violence from a human rights perspective.

❖ A Case study/ video discussion on gender-based violence in view of human rights

**Textbooks**

1. Professional Ethics: R. Subramanian, Oxford University Press, 2015.
2. Ethics in Engineering Practice & Research, Caroline Whit beck, 2e, Cambridge University Press 2015.
3. A Bilingual Textbook on Gender" written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu and published by Telugu Akademi, Hyderabad,Telangana State in the year 2015.

**Reference Books**

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila."I FoughtForMy Life…andWon."Availableonlineat: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohailaabdulal/
3. Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S Pritchard,Michael J Rabins, 4e , Cengage learning, 2015.
4. Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**EFFECTIVE TECHNICAL COMMUNICATION**

**Course Code: GR22A2108** **L/T/P/C:2/0/0/0**
**II Year I Semester**

**Course Outcomes:**
1. Demonstrate proficiency in producing well-structured technical documents adhering to standard writing conventions and industry-specific guidelines.
2. Develop critical analysis skills to assess and evaluate technical documents.
3. Develop a habit of lifelong learning in technical communication, recognizing its importance in their personal and professional growth.
4. Exhibit effective oral communication skills by delivering technical presentations with clarity, coherence, and appropriate use of visual aids.
5. Exemplify intercultural competence in technical communication.

**UNIT- I**
**Information Design and Development**- Different kinds of technical documents, Information development life cycle, Organization structures, Factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media, Artificial Intelligence - Voice of the future, Everyday life, Communicating with Machines.

**UNIT-II**
**Technical Writing, Grammar, and Editing**- Abstract Writing, Technical writing process, forms of discourse, Collaborative writing, creating indexes, technical writing style and language, Basics of grammar, and study of advanced grammar, Introduction to Digital Humanities, Managing technical communication projects, Time estimation, Single sourcing, Localization.

**UNIT-III**
**Self-Development and Assessment**- SWOT, Self-assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, Career planning, Self-esteem, Managing Time, Personal memory, Taking notes, Complex problem-solving, Stress Management, Working with Rhythm and Balance, Emotional Intelligence, Six Hats of Thinking.

**UNIT-IV**
**Communication and Technical Writing**- Group discussion, Oral presentation, Resume writing, Interview skills, Graphic presentation, Personality Development, Technical articles, Official notes, Memos, and Minutes of meetings.

**UNIT-V**
**Ethics**- Business ethics- Corporate Social Responsibility-importance, need, stories, Engineering Ethics, Role and responsibility of engineer, Work culture in jobs.

**Textbooks:**
1.M Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.

**Reference Books:**
1. Raman Sharma, Technical Communication, Oxford Publication, London, 2013.

2. Meenakshi Raman, Shalini Upadhyay, SOFT SKILLS Key to Success in Workplace and Life, Cengage Learning India Pvt. Ltd., Delhi, 2018.
3. Ron Cowan, The teacher's Grammar of English, CAMBRIDGE UNIVERSITY PRESS,New Delhi,2008.
4. Shiv Khera, You Can Win, Macmillian Books, New York, 2003.
5. Arthur D. Rosenberg, David Hizer, The Resume Handbook, Adams Media, anF+W Publications Company, 57 Littlefield Street,Avon, MA02322,USA.
6. M. Kay DuPont, Business Etiquette & Professionalism, Viva Books private Limited, Hyd.,2005
7. David F. Beer and David McMurrey, Guide to Writing as an Engineer, John Willey, New York, 2004

# II YEAR
# II SEMESTER

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# COMPUTER ORGANIZATION

**Course Code: GR22A2073** **L/T/P/C: 3/0/0/3**
**II Year II Semester**

**Course Outcomes**:
1. Demonstrate knowledge of register organization of a basic computer system
2. IncorporateIn-depth understanding of control unit organization and microprogrammed control.
3. Understand the performance of central processing unit of a basic computer system.
4. Apply various algorithms to perform arithmetic operations and propose suitablehardware and appraise various methods of communications with I/O devices.
5. Analyze and emphasize various communication media in the basic computer system using design of various memory structures and Multiprocessor systems.

## UNIT I

**Basic Structure of Computers:** Computer Types, Functional unit, Data Representation, Fixed Point Representation, Floating – Point Representation, Error Detection codes.
**Register Transfer Language and Micro operations:** Register Transfer language. Register Transfer, Bus and memory transfers, Micro Operations and its types, Arithmetic logic shift unit.

## UNIT II

**Basic Computer Organization and Design**: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.
**Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit, Micro program Sequencer, Hard wired control Vs Micro programmed control.

## UNIT III

**Central Processing Unit Organization:** General Register Organization, STACK organization. Instruction formats, Addressing modes. DATA Transfer and manipulation, Program control. Reduced Instruction set computer.

**Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Floating – point Arithmetic operations, BCD Adder.

## UNIT IV

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP).
**Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Dependencies, Vector Processing.

## UNIT V

**Memory Organization:** Memory Hierarchy, Main memory- RAM and ROM chips, Memory Address map, Auxiliary memory – Magnetic Disks, Magnetic Tapes, Associative Memory – Hardware Organization, Match Logic, Cache Memory – Associative mapping, Direct mapping, Set associative mapping, Writing into cache and cache initialization, Cache Coherence, Virtual memory – Address Space and Memory Space, Address mapping using

pages, Associative Memory page table, Page Replacement.

**Multi Processors:** Characteristics or Multiprocessors, Interconnection Structures, Cache Coherence, Shared Memory Multiprocessors.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books:**

1. Computer Systems Architecture – M.Moris Mano, 3rd Edition, Pearson/PHI
2. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.

**References:**

1. Computer Organization and Architecture – William Stallings 7th Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 6th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudi SpringerInt. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, 5th Edition Elsevier
5. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# OPERATING SYSTEMS

**Course Code: GR22A2074** **L/T/P/C: 2/1/0/3**
**II Year II Semester**

**Course Objectives:**
1. Understand main concepts of OS and to analyze the different CPU schedulingpolicies.
2. Understand process synchronization and deadlock management.
3. Understand memory management and virtual memory techniques.
4. Appreciate the concepts of storage and file management.
5. Study OS protection and security concepts.

**UNIT I**

**Operating System Overview:** Objectives and functions, Computer System Architecture, Evolution of Operating Systems, System Services, System Calls, System Programs, OS Structure, Virtual machines.
**Process Management:** Process concepts, CPU scheduling-criteria, algorithms with evaluation, Preemptive / Non-Preemptive Scheduling, Threads, Multithreading Models.

**UNIT II**

**Concurrency:** Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors.
**Deadlocks:** Principles of deadlock–system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock.

**UNIT III**

**Memory Management:** Swapping, contiguous memory allocation, paging, structure of the page table, segmentation.
**Virtual Memory**: Demand paging, page replacement algorithms, Allocation of Frames, Thrashing.

**UNIT IV**

**Mass-storage structure:** Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.
**File System implementation:** Access Methods, File system structure, file system implementation, directory implementation, allocation methods, free-space management.

**UNIT V**

**Protection:** Goals and Principles of Protection, Implementation of Access Matrix, Access control, Revocation of Access Rights.
**Security:** The Security problem, program threats, system and network threats, implementing security defenses.

**TEXT / REFERENCE BOOKS:**

1. Operating System Concepts Essentials, 9th Edition by Avi Silberschatz, Peter Galvin,Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings,Prentice Hall of India.

3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley,Irwin Publishing
4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Modern Operating Systems, Andrew S Tanenbaum 3rd Edition PHI.
6. Operating Systems, R. Elmasri, A. G. Carrick and D. Levine, Mc Graw Hill.
7. Operating Systems in depth, T. W. Doeppner, Wiley.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# APPLIED STATISTICS FOR ENGINEERS

**Course Code: GR22A2006** **L/T/P/C:3/0/0/3**
**II Year II Semester**

**Pre-requisites: Elementary statistics, Calculus and Linear algebra**

**Course Outcomes**

1. Compute and interpret descriptive statistics.
2. Make use of the propertiesof Binomial, Poisson, Normal and Exponentialdistributions to estimate the variability of occurrence
3. Analyze univariate and bivariate data using statistical modelling
4. Apply inferential statistics to suggest explanations for a situation arising in the case oflarge and small samples
5. Apply nonparametric tests when the sampled data is distribution-free

**UNIT I**
**Basic Statistics and Random Variables**
Measures of central tendency, moments, Skewness and Kurtosis.
Randomvariables-Discrete&Continuous,Probability mass function and density functions, constants of random variables(Mean, Variance and Moments about mean), Concepts of Bivariate distributions and Covariance.

**UNIT II**
**Discrete and Continuous Probability Distributions**
Binomial, Poisson,Normal and Exponential (Properties and applications), evaluation of statistical parameters for Binomial, Poisson and Normal distributions.

**UNIT III**
**Correlation, Regression and Time Series analysis**
Correlation(Karl-Pearson's correlation coefficient and Spearman's Rank correlation (Statements of their properties and problems)), Simple and Multiple Linear Regression of three variables (Statements of properties of Regression coefficients and problems).
Components of Time series, Additive and Multiplicative models of Decomposition of Time series, Estimation of trend by method of Moving averages, fitting of various mathematical curves (Straight line and Second degree parabola ).

**UNIT IV**
**Testing of Hypothesis-1**
Concept of Sampling distribution and Standard error; tests for single proportion, difference of proportions in large sampling, single mean and difference of means in large and small sampling .Estimation of confidence interval for population mean and population proportions.

**UNIT V**
**Testing of Hypothesis-2**
Tests for Population variance, ratio of variances, ANOVA 1-way and 2-way.
Non-parametric Inference: Comparison with parametric inference, Use of order statistics.

Wilcoxon signed rank test, Mann-Whitney U- test and Run test.
Chi-square test for independence of attributes.

**Texts and References:**

1. S. C.Gupta &V.K.Kapoor, “Fundamentals of Mathematical Statistics”, S.Chand.
2. Richard A.Johnson,” Probability and Statistics for Engineers”, Pearson Education.
3. Jay Devore, “Probability and Statistics for Engineering and the Sciences”,Cengage learning.
4. Murat Kulahci,“Time series analysis and forecasting by example”,John Wiley &Sons.
5. S. C.Gupta &V.K.Kapoor, “Fundamentals of Applied Statistics”, S.Chand.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**FULL STACK WEB DEVELOPMENT**

**Course Code: GR22A2076** **L/T/P/C: 3/0/0/3**
**II Year II Semester**

**Course Outcomes:**

1. Enable participants to develop a complete web application from the scratch thatincludes Front-end, Back-end and Data-exchange technologies
2. Attain the knowledge of web development basics, HTML, CSS and buildinginteractive web pages using JavaScript & jQuery.
3. Design the applications using node.js and Angular
4. Construct the real-world applications using PHP and MySQL
5. Become an industry-ready engineer who can be readily deployed in a project

**UNIT I**

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets. Introduction to Java Scripts, Objects and Functions in java script, Manipulating DOM, HTML DOM Events, Learning Ajax
jQuery Programming: Selectors & Mouse Events, Form Events, DOM Manipulation, Effects & Animation, Traversing & Filtering

**UNIT II**

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers.
Angular JS: Introduction, Expressions, Modules, directives, AngularJS HTML DOM, Events, Forms.

**UNIT III**

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

**UNIT IV**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies, and session for session tracking, connecting to database in JSP

**UNIT V**

Database Design using MySQL: An Overview of SQL, XAMPP and MySQL Setup, Create Tables, Columns and Insert Data, Selecting Data, Distinct, Aliases & Concat,
Update, Delete & Alter, Foreign Keys, Table Joins.
PHP Programming Fundamentals, PHP Data Types & Dates, Cookies, Sessions, Objects and Classes, Intro to PHP & MySQL, creating a MySQL Database, Connect & Fetch data from MySQL, Insert and Delete MySQL data from PHP.

**Textbooks:**

1. Web Programming, building internet applications, Chris Bates 2nd edition,WILEY Dreamtech

2. Learning AngularJS: A Guide to AngularJS Development, Ken Williamson, O'Reilly
3. Java Server Pages –Hans Bergsten, SPD O'Reilly
4. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected ofa Modern Full Stack Web Developer 1st ed. Edition, Kindle Edition by Chris Northwood

**References:**

1. Quick Start Full Stack Web Development: Build Secure Asynchronous Single-PageApps with Flask, React, and PostgreSQL by Erik M. Ferragut (Author)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DESIGN AND ANALYSIS OF ALGORITHMS**

**Course Code : GR22A2077** **L/T/P/C: 3/0/0/3**
**II Year II Semester**

**Course Outcomes:**
1. Distinguish various performances of algorithms.
2. Illustrating Divide and Conquer Design Paradigm algorithms.
3. Examining various algorithms based on Dynamic programming paradigm.
4. Discriminate greedy approach and back tracking algorithms.
5. Demonstrate branch and bound problems and Distinguish problems related to variouscomplexity classes.

**UNIT I**
**Introduction to Algorithms:** Definition of an algorithm, properties of an Algorithm, performance analysis--space complexity & time complexity, amortized analysis

**UNIT II**
**Disjoint sets:** Disjoint set Representation, Operations, union and find algorithms.
**Divide and Conquer:** General method, applications, binary search, Quick sort, merge sort, Strassen's matrix multiplication.

**UNIT III**
**Dynamic Programming:** General method, applications, optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, travelling salesperson problem, optimal rod-cutting-Top down approach and bottom up approach.

**UNIT IV**
**Greedy Method:** General method, applications-- job sequencing with deadlines, 0/1 knapsack problem, minimum cost spanning trees, single source shortest path problem, activity selection problem.
**Backtracking:** General method, applications, n-queen problem, sum of subsets problem, Hamiltonian cycles.

**UNIT V**
**Branch and Bound:** General method, applications, travelling sales person problem, 0/1 knapsack problem: LC branch and bound solution, FIFO branch and bound solution
**Complexity Classes:** Non deterministic algorithms, deterministic algorithms, relationship between P and NP, NP-completeness, circuit-satisfiability problem, 3-CNF satisfiability.

**Text Books/ References:**
1. Ellis Horowitz, SatrajSahni and S Rajasekharam, Fundamentals of Computer Algorithms, Galgotia publishers
2. T H Cormen, C E Leiserson, and R L Rivest, Introduction to Algorithms, 3rdEdn, Pearson Education
3. Cormen, Thomash H., Leiserson, Charles E., Rivest, Ronald L., & Stein, Clifford. introduction to Algorithms. 3rd Edition. 2010.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**FULL STACK WEB DEVELOPMENT LAB**

**Course code: GR22A2078** **L/T/P/C:0/0/3/1.5**
**II Year II Semester**

**Prerequisites:**

Knowledge of Object Oriented Programming concepts

**Course Outcomes:**
1. To design a website
2. To implement client-side validation.
3. To develop the robust and scalable websites, backend APIs
4. To implement end-to-end applications.
5. To design web applications with database connectivity.

**TASK 1**

Develop a website by implementing JavaScript functions for the following problems:
Parameter: A string
Output: The position in the string of the left-most vowel Parameter: A numberOutput: The number with its digits in the reverse order

**TASK 2**

Write a JavaScript program to calculate the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.

**TASK 3**

Write a JavaScript program to display text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.

**TASK 4**

Write a JavaScript program to design a simple calculator to perform the following operations: sum, product, difference and quotient

**TASK 5**

Write a JQuery AJAX program to request data from the server with an HTTP.

**TASK 6**

Create following Student Information form with submit and reset functionality using Angular JS.


Sample AngularJS Form.

**TASK 7**

Use AngularJS features to make a shopping list, where you can add or remove items as shown below.

My Shopping List

- Milk×
- Bread×
- Cheese×

Add

**TASK 8**

Write a Servlet Program that accepts the Mobile phone details from user and displays the details on the next page. Create a table and perform insert operation as shown in the Figure 1 below. Connect using JDBC to display each record at a time on the webpage using servlet request and response.

**Mobile Details**

| Model Id | Price(Rs.) | Company | Color |
|---|---|---|---|
| J2 | 12000 | Samsung | Silver |
| 6600 | 20000 | Nokia | Black |
| Note 3 | 12000 | Red Mi | Grey |
| Zenfone 2 | 20000 | Asus | Grey |

Figure 1: Table Details

**TASK 9**

Develop a JSP Program to validate a particular user login based on the usernamepassword stored in the database and display a welcome page.

**TASK 10**

Write PHP programs to do the following tasks:

a. Implement simple calculator operations.
b. Find the transpose of a matrix.
c. Multiplication of two matrices.
d. Addition of two matrices.

**TASK 11**

Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". Write a PHP program that does the following:

a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named states List.
b. Search for a word in states that begins with k and ends in s. Perform a case insensitive comparison. [Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of states List.
c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.
d. Search for a word in states that ends in a. Store this word in element 3 of the list.

**TASK 12**

Write a PHP program to sort the student records which are stored in the database using selection sort.

**Text books:**

1. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker 1st ed. Edition by Frank Zammetti
2. Web Design with HTML, CSS, JavaScript and jQuery Set 1st Edition by Jon Duckett
3. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer 1st ed. Edition, Kindle Edition by Chris Northwood

**References:**

1. Quick Start Full Stack Web Development: Build Secure Asynchronous Single- Page Apps with Flask, React, and PostgreSQL by Erik M. Ferragut (Author)
2. Full Stack Web Development For Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP by Riaz Ahmed.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**OPERATING SYSTEMS LAB**

**Course Code: GR22A2079** **L/T/P/C: 0/0/3/1.5**
**II Year II Semester**

**Course Outcomes:**

1. Evaluate the performance of different types of CPU scheduling algorithms
2. Implement producer-consumer problem, reader-writers problem,and Dining philosophers' problem using semaphores.
3. Simulate Banker's algorithm for deadlock avoidance
4. Implement paging techniques and page replacement policies, memoryallocation techniques in memory management.
5. Implement disk scheduling techniques and file allocation strategies .

**TASK 1**

Practice the following commands in UNIX environment

a) cp b) rm c) mv d) chmod e) ps f) kill

**TASK 2**

Write a program that makes a copy of a file using standard I/O and system calls.

**TASK 3**

Simulate the following Scheduling algorithms.

a) FCFS b)SJF c)Priority d)Round Robin

**TASK 4**

Simulate the Producer Consumer problem using semaphores.

**TASK 5**

Simulate the Readers – Writers problem using semaphores.

**TASK 6**

Simulate the Dining Philosophers problem using semaphores

**TASK 7**

Simulate Bankers Algorithm for Deadlock Avoidance.

**TASK 8**

Simulate First Fit and Best Fit algorithms for Memory Management.

**TASK 9**

Simulate paging technique of memory management.

**TASK 10**

Simulate page replacement Algorithms. a)FIFO b)LRU

**TASK 11**

Simulate following Disk Scheduling algorithms.

a)FCFS b)SSTF c)SCAN d)C-SCAN
e)LOOK f)C-LOOK

**TASK 12**

Simulate file allocation strategies.

a) Sequential b)Indexed c)Linked

**Text Books/ References:**

1. Operating System Concepts- Abraham Silberchatz , Peter B. Galvin, Greg Gagne7th Edition, JohnWiley.
2. Operating Systems– Internal and Design Principles Stallings, Fifth Edition–2005,Pearson education/PHI.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**VISUAL PROGRAMMING USING C# AND .NET LAB**

**Course Code: GR22A2080** **L/T/P/C: 0/0/4/2**
**II Year II Semester**

**Course Outcomes:**

1. Create Event Driven Applications.
2. Develop asynchronous applications
3. Deploy Web services
4. Build database applications using ADO.NET
5. Understand the Language Integrated Query (Linq) library

**TASK 1**

Write a program to check weather a given number is palindrome using C#

**TASK 2**

Create a program to implement a concept of Overloading using C#.Net.

**TASK 3**

Write a program to store the employee details using class and methods in C# .NET

**TASK 4**

Create a program to implement the concepts of OOPS for creating class, inheritance

**TASK 5**

Create a Window Form using HTML Controls

**TASK 6**

Perform String Manipulation with the String Builder and String Classes and C#:
Demonstrates some basic string manipulation using both the String Builder and Stringclasses.

**TASK 7**

Demonstrate the concept of
a) Creating a Thread
b) Managing a Thread
c) Deleting a Thread

**TASK 8**

Create a Sample program to Demonstrate Insertion of data intodatabase.

**TASK 9**

Create a Program to Demonstrate ColorDialog in C#.

**TASK 10**

Create a program to perform validation using validation controls.

**TASK 11**

Create a Sample program to Demonstrate creation and usage of Dynamic Link Libraries in C#.

**TASK 12**

Student Management System application development with required details: Use ADO.NET for storing and manipulating the data. Develop the necessary forms for the better user interface.

**Text Books:**

1. Professional C# 5.0 and .NET 4.5.1, Christian Nagel, Jay Glynn and Morgan Skinner, John Wiley & Sons Inc.
2. Beginning ASP.net 4.5.1 in C# and VB, Imar Spaanjaars, Wrox Publication, 2014.

**References:**

1. Microsoft Visual C# Step by Step, John Sharp, O'Reilly Media, Inc., 2013.
2. A Tester's Guide to .NET Programming, Randal Root and Mary Romero Sweeney, Apress

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING & TECHNOLOGY
# ENVIRONMENTAL SCIENCE

**Course Code: GR22A2001** **L/T/P/C:2/0/0/0**
**II Year II Semester**

**Course Outcomes:**

1. Gain a variety of experiences & acquire a basic knowledge about the environment &its
2. allied
3. problems
4. Interpret the key components in safe guarding the environment
5. Evolve an individual vision of harmonious interaction with natural world.
6. Appraise the quality of environment in order to create a healthy atmosphere
7. Familiarize with the individual responsibilities towards green revolution

## UNIT I

## INTRODUCTION AND AWARENESS ACTIVITIES

Environmental Science: Introduction, Definition, scope and importance.AWARENESS ACTIVITIES

Small group meetings about:

- Water management
- Waste water treatment
- Projects Vs Environment
- Zero waste management
- Circular economy
- Impact of Science & Technology on Environment
- E-waste management
- Biodiversity loss
- Renewable Energy

## UNIT II

## SLOGAN AND POSTER MAKING EVENT

- Food waste management
- Rain water harvesting
- Climate change
- Green Power
- Water conservation
- Green at work
- Role of IT in environment and human health
- Sustainable development

## UNIT III

## EXPERT LECTURES ON ENVIRONMENTAL SCIENCE

- Environmental Impact Assessment
- Industrial waste treatment
- Regenerative farming/Organic farming/Vertical gardens/Hydroponics
- Circular Economy

**UNIT IV CLEANLINESS DRIVE**

- Indoor air pollution
- Vehicular pollution
- Visual pollution
- Waste management at home
- Composting
- Plastic recycling

**UNIT V**

**CASE STUDIES**

- HPCL and LG Polymers disasters in Vizag
- Oleum gas leak in Delhi
- Mathura Refinery & Taj Mahal
- Conservation of Hussain Sagar lake
- The Cleanliest city of India-Surat
- Green Buildings in India
- KBR park in Hyderabad (Environmental protection Vs Development)
- Fluorosis and remediation
- Evaluation of STP or ETP operation in Hyderabad
- Ecotourism & its impacts
- Positive Impact on Environment due to Lockdown Forced by Corona Pandemic

**TEXT BOOKS:**

1. Environmental Studies for UG Courses, Erach Bharucha, UGC Publications, Delhi, 2004.
2. Textbook of Environmental Studies, Deeksha Dave, S. S. Katewa, Cengage Delmar Learning India Pvt., 2012.

**REFERENCES:**

1. Introduction to Environmental Science, Y. Anjaneyulu, BS Publications, 2004.
2. Environmental Studies, Anubha Kaushik & C. P. Kaushik, 4th Edition, New Age International Publishers

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**REAL-TIME RESEARCH PROJECT/ SOCIETAL RELATED PROJECT**

**Course Code: GR22A2109** **L/T/P/C:0/0/4/2**
**II Year II Semester**

**Course Outcomes:**
**At the end of this course, students will be able to:**

1. Predict the Field domain in the specialized area under Engineering discipline.
2. Evaluate and Obtained the category of the solution with help of Real time studies
3. Analyse and Discuss the field problems using software tools /Modes/simulations and experimental investigations.
4. Implementing the solution of problem statement.
5. Prioritize the reports and deliver the final work with presentation.

# III YEAR
# I SEMESTER

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# COMPUTER NETWORKS

**Course Code: GR22A3044** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Pre-requisites:**

Students are expected to have knowledge in

- Basic computer hardware
- Multi user Operating systems
- Types of Ports and their purpose

**Course Outcomes:**

1. Articulate basic terminologies of Computer Networks and transmission media in building a network for an organization.
2. Interpret the error correction and detection techniques and MAC Protocols for specific networks.
3. Illustrate the purpose of routing algorithms in real time applications.
4. Mind map the protocols and mechanism used in transport layer.
5. Integrate the application layer protocols in Internet based Applications.

**UNIT I**

**Computer Networks:** Uses of Computer Networks, Network Hardware, Network Software, Types of networks, Network topologies, Layered architecture. Reference Models: OSI, TCP/IP, ARPANET, Internet, and ATM header, Reference model, QoS.
**Physical Layer:** Guided Transmission Media, Wireless Transmission Media, Communication Satellites. Switching and Multiplexing, Mobile Telephone Network, GSM.

**UNIT II**

**Data link layer**: Design Issues, Framing, Error Detection, Elementary Data Link Protocol, and Sliding Window Protocols.
**Medium Access sub layer:** Static vs. Dynamic, Multiple Access Protocols: ALOHA, CSMA and Collision Free Protocols. Ethernet (IEEE 802.3), wireless LANS (IEEE 802.11), Bluetooth (IEEE 802.15), The Network and internetwork devices.

**UNIT III**

**Network Layer:** Routing Algorithms, Flooding, Broadcasting and Multicasting. Congestion Control Algorithms: General Principles of Congestion Control, Prevention Policies, Congestion Control in Virtual and Datagram Subnets, QoS in the Internet.

**The Network Layer in the Internet:** IPv4 Addressing Scheme, Subnetting and Masking, CIDR, NAT, Intra and Inter domain routing protocols, Mobile IP, IPv6 Header Format and Transmission Methods.

**UNIT IV**

**Transport Layer:** Transport Services, Elements of Transport Protocols.

**Transport Layer Protocols:** TCP & UDP protocols, TCP Connection Establishment and Release,TCP Congestion Control, TCP Fast Retransmit and Recovery, Slow start Mechanism

in TCP, Transaction Oriented TCP.

**UNIT V**

**Application Layer:** DNS, Electronic Mail, the World Wide Web, FTP, HTTP, TELNET.
**MultiMedia:** Audio and video compression techniques, streaming audio and video, VOIP.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books:**

1. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education/PHI
2. Data Communications and Networking-Behrouz A. Forouzan, Third Edition TMH.

**References:**

1. An Engineering Approach to Computer Networks-S.Keshav,2nd Edition,Pearson Education.
2. Understanding communications and Networks- 3rd Edition, W.A. Shay, Thomson
3. Computer Networks – Dr.G.S.Bapiraju, 2nd Edition GRIET Publications.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# DATA WAREHOUSING AND DATA MINING

**Course Code: GR22A3069** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Prerequisites**:

Students are expected to have knowledge of transactional and relational databases, probability and statistics.

**Course Outcomes:**

1. Demonstrate the concepts of data mining, its applications, and various pre-processing methods.
2. Develop a prototype for data warehouse and data mart for any organization.
3. Apply different types of association rule mining techniques for solving practical problems.
4. Implement classification models and algorithms in data warehouses and data mining.
5. Analyze clustering techniques and recent trends in advanced data mining techniques.

**UNIT I**

**Introduction:** Why Data mining, What is Data Mining, What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Which Technologies are used, Data Mining Task Primitives, Integration of a Data Mining System witha Database or a Data Warehouse System, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

**UNIT II**

**Data Warehouse and Online Analytical Processing:** Data Warehouse-Basic concepts, Data Warehouse Modeling - Multidimensional Data Model, Star, Snowflake, Fact Constellation Schemas, Concept Hierarchies, Measures, Typical OLAP Operations, From Data Warehousing to Data Mining.

Data Warehouse Implementation - Efficient Data Cube Computation: Overview, Indexing OLAP Data – Bitmap Index, Join Index.

**UNIT III**

**Data Characterization and Discrimination:** Data Generalization by Attribute-Oriented Induction.

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Market Basket Analysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

**UNIT IV**

Classification: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, k-Nearest-Neighbor Classifiers.

Prediction: Introduction to Regression techniques, Linear Regression.

Accuracy and Error measures: Classifier Error measures, Predictor Error Measures,

Evaluating the accuracy of Classifier and Predictor.

**UNIT V**

**Cluster Analysis:** What is Cluster Analysis, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods - k-Means, k-Mediods, Hierarchical Methods - AGNES and DIANA, Density-Based Methods - DBSCAN. Introduction to Mining Complex Data Types: Mining Data Streams, Mining Time- Series Data, Mining Sequence Patterns in Transactional Databases, Mining Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Textbooks:**

1. Data Mining Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Third Edition, 2012.
2. Introduction to Data Mining Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

**References*:***

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, Pearson Edn Asian

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# ARTIFICIAL INTELLIGENCE

**Course Code: GR22A3070** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Prerequisites:**
A Course in Artificial intelligence would require the knowledge of following concepts
- Logic Theory
- Probability Theory
- Numerical Analysis
- Operations on Matrices

**Course Outcomes:**
1. Select an appropriate searching strategy for developing intelligent agents to find solution in optimized way using building blocks of AI.
2. Apply Prepositional and First Order Logic methods to resolve decisions for Knowledge-based agents.
3. Practice uncertain knowledge and reasoning handling using Bayesian Networks.
4. Analyze the working of temporal model, Hidden Markov Model, and Decision trees.
5. Breakdown the steps to construct a small robot capable of performing perception and movement based on techniques learnt in the course.

**UNIT I**

**Introduction to AI:** Introduction, Foundation of AI, History of Intelligent Agents, Agents and environments, Concept of Rationality, Nature of environments & Structure of Agents, Problem solving agents and formulation, Searching For Solutions and Strategies, Uninformed search strategies BFS, DFS, Heuristic approach, Greedy best search, A* Search, Game Playing: Adversal search, Games, Min-Max algorithm, Optimal decisions in multiplayer games, AlphaBeta pruning.

**UNIT II**

**Knowledge Representation & Reasons**: Logical agents, Knowledge based agents, The Wumpus world, Logic: Proportional logic, Resolution patterns in proportional logics, Resolution: Forwardand Backward chaining, First order logic: Inference in First order logic, Proportional vs first order inference, Unification & Lifting, forward chaining, Resolution, Practice problems.

**UNIT III**

**Uncertain Knowledge and Reasoning**: Uncertainty-Acting under uncertainty, Basic probability notion, the axioms of probability, inference using full joint distribution, Independence, Bayes' rule.
**Probabilistic Reasoning**: Representing Knowledge in uncertain domain, the semantics of Bayesian networks, efficient representations of conditional distributions, exact inference in Bayesian networks, approximate inference in Bayesian networks.

**UNIT IV**

**Probabilistic reasoning over time**: Time and uncertainty, inference in temporal model, Hidden Markov models.

**Planning:** Overview, Components of Planning, Conditional Planning, Goal Stack Planning.
**Learning**: Learning from observations: Forms of learning, inductive learning, learning decision trees, ensemble learning, why learning works.

**UNIT V**

**Perception**: Image formation, Early Image Processing operations- Edge detection, image segmentation. Object recognition, using vision for manipulation and navigation.
**Robotics**: Introduction, Robot hardware, robotic perception, planning to move, robotic software architectures, application domains.
Introduction to Expert Systems, Conversational AI, Generative AI.

**Text Books:**

1. Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, 4th Edition, Pearson

**References:**

1. Artificial Intelligence, Elaine Riche & Kevin Night, 2nd Edition, Tata McGraw Hill Education Pvt Ltd.
2. Artificial Intelligence, Kevin Knight, Elaine Rich, Shivashankar B. Nair, 3rd Edition, McGraw Hill Education Pvt Ltd.
3. Paradigms of Artificial Intelligence Programming, Case Studies in Common Lisp, Peter Norvig, Morgan Kaufmann Publisher.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**PRINCIPLES OF PROGRAMMING LANGUAGES**
**(PROFESSIONAL ELECTIVE – I)**

**Course Code: GR22A3047** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Course Outcomes:**
1. Evaluate language constructs and programming paradigms.
2. Apply formal methods of syntax, semantics and data types.
3. Illustrate sub programs, blocks and control structures in different programming languages.
4. Construct abstract data types, concurrency and exceptions.
5. Compare functional and imperative languages.

**UNIT I**
**Preliminary Concepts:** Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, Influences on Language design, Language categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming , Logic Programming.
**Programming Language Implementation:** Compilation and Virtual Machines, Programming environments.

**UNIT II**
**Syntax and Semantics:** General Problem of describing Syntax and Semantics, formal methods of describing syntax - BNF, EBNF for common programming language features, parse trees, ambiguous grammars, attribute grammars, denotation semantics and axiomatic semantics forcommon programming language features.
**Data types:** Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types, Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants and variableinitialization.

**UNIT III**
**Expressions and Statements:** Arithmetic relational and Boolean expressions, Short circuit evaluation, mixed mode assignment, Assignment Statements, Control Structures– Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands.
**Subprograms and Blocks:** Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub- program names, design issues for functions, user defined overloaded operators, co routines.

**UNIT IV**
**Abstract Data types:** Abstractions and encapsulation, Introduction to data abstraction, design

issues, language examples, C++ parameterized ADT, object oriented programming in C++, Java, C#,Python

**Concurrency:** Subprogram level concurrency, semaphores, monitors, message passing, Java threads, Examples: Java RMI, Parallel Java, Parallel C

**Exception handling:** Exceptions, Exception propagation, Exception handler in C++ and Java and PHP. Handling Large Database.

**UNIT V**

**Functional Programming Languages:** Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages and comparison of functional and imperative languages.

**Logic Programming Language:** Introduction and overview of logic programming, basic elementsof prolog, application of logic programming.

**Textbooks:**

1. Concepts of Programming Languages Robert .W. Sebesta 6/e, Pearson Education.
2. Programming Languages –Louden, Second Edition, Thomson.

**References:**

1. Programming languages –Ghezzi, 3/e, John Wiley
2. Programming Languages Design and Implementation – Pratt and Zelkowitz, FourthEdition PHI/Pearson Education

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**MOBILE APPLICATION DEVELOPMENT**

**(PROFESSIONAL ELECTIVE – I)**

**Course code: GR22A3125** **L/T/P/C: 3/0/0/3**

**III Year I Semester**

**Course Outcomes:**

At the end of the course the student will be able to

1. Design simple GUI applications.
2. Apply key technological principles and methods for delivering and maintaining mobile applications on Android devices.
3. Make use of built-in widgets and components.
4. Design apps which uses the database to store data locally.
5. Develop the apps that make use of interfaces with built-in views.

**UNIT I**

**Java Concepts:** OOPs Concepts, Inheritance in detail, Exception handling, Packages & interfaces, Multi-threading, JVM & .jar file extension, SQL-DML and DDL Queries.

**UNIT II**

**Introduction to Android:** What is Android? Setting up development environment, Dalvik Virtual Machine & .apk file extension, Fundamentals: Basic Building blocks - Activities, Services, and Broadcast Receivers & Content providers. UI Components - Views & notifications. Components for communication -Intents & Intent Filters, Android API levels (versions & version names).

**UNIT III Application Structure (in detail):** Android Manifest.xml, uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, Activities and Activity lifecycle, First sample Application

**Emulator-Android Virtual Device:** Launching emulator, editing emulator settings, Introduction to DDMS, Basic UI design, Preferences, Menu, Intents- Implicit Intents, Explicit Intents.

**UNIT IV Content Providers:** SQLite Programming, SQLite OpenHelper, SQLite Database, Cursor, Reading and updating Contacts, Reading bookmarks, Examples.

**UNIT V Threads:** Threads running on UI thread (runOnUiThread), Worker thread, Handlers & Runnable, AsynTask, and Examples. UI design, Tabs and Tab Activity, Styles & Themes, Examples.

**Text Books:**

1. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9Pie apps starting from zero programming experience, 2nd Edition by John Horton
2. Head First Android Development: A Brain-Friendly Guide by Dawn Griffiths
3. Android Cookbook: Problems and Solutions for Android Developers, Second Edition (Grayscale Indian Edition) by Ian Darwin.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**FORMAL LANGUAGE AND AUTOMATA THEORY**
**(PROFESSIONAL ELECTIVE – I)**

**Course Code: GR22A3071** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Prerequisites:**

**Course Outcomes***:*
1. Design Finite Automata models.
2. Construct Regular Expressions and equivalent automata models.
3. Formulate Grammars for Formal languages.
4. Represent Normal Forms and Push Down Automata.
5. Experiment with Computational models.

**UNIT I**

Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings and languages, deterministic finite automaton and non- deterministic finite automaton, transition diagrams and language recognizers.
Finite Automata: NFA with ϵ transitions - significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without ϵ transitions, NFA to DFA conversion, Minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

**UNIT II**

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite automata for a given regular expressions, Conversion of finite automata to Regular expressions, Pumping lemma of regular sets, closure properties of regular sets.

**UNIT III**

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms, Right most and leftmost derivation of strings.

**UNIT IV**

Context Free Grammars: Ambiguity in context free grammars, Minimization of context free grammars, Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages, Enumeration of properties of CFL.
Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, equivalence of CFL and PDA, inter conversion, Introduction to DCFL and DPDA.

**UNIT V**

Turing Machine: Turing Machine, definition, model, design of TM, computable functions, recursively enumerable languages, Church's hypothesis, counter machine, types of Turing

machines.

Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, Decidability of problems, Universal Turing Machine, un decidability of posts correspondence problem.

**Text Books:**

1. Introduction to Automata Theory Languages and Computation, Hopcroft H.E. and Ullman J. D, Pearson Education.
2. Introduction to Theory of Computation–Michael Sipser 2nd edition, Thomson.

**References:**

1. Introduction to Computer Theory, Daniel I.A. Cohen, JohnWiley.
2. Introduction to languages and the Theory of Computation, John C Martin, TMH.
3. Theory of Computer Science - Automata languages and computation - Mishra andChandra shekaran, 2nd edition, PHI.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**CLOUD COMPUTING**
**(PROFESSIONAL ELECTIVE – I)**

**Course Code:GR22A3126** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Prerequisites:**

Students are expected to have knowledge on Operating systems, Virtualization and Networking.

**Course Outcomes:**

1. Identify varies features, advantages and challenges of cloud computing, compare their operation, implementation and performance
2. Applying knowledge of Virtualization, Analyze and compare different types of clouds and cloud services.
3. Validating the financial and technological implications in selecting cloud computing paradigm for an organization.
4. Compare operation and economic models of varies trending cloud platforms in IT Industry.
5. To know how to overcome the security challenges and risks involved in the cloud.

**UNIT I**

Understanding Cloud Computing: Cloud Computing, Introduction to Cloud Computing, Cloud Architecture and Cloud Services (IaaS, PaaS, SaaS) , Cloud models– Public vs Private, Cloud Technologies for Network-Based System , System Models for Distributed and Cloud Computing , NIST Cloud Computing Reference Architecture

**UNIT II**

Virtualization: Basics of Virtualization, Types of Virtualizations, Implementation Levels of Virtualization, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data-centre Automation

**UNIT III**

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources

**UNIT IV**

Programming Model: Parallel and Distributed Programming Paradigms, Map Reduce, Twister and Iterative Map Reduce, Hadoop Library from Apache, Mapping Applications, Programming Support, Google App Engine, Amazon AWS, Cloud Software Environments, Eucalyptus, Working with EC2 API, Open Nebula, Open Stack, Aneka, CloudSim

**UNIT V**

Security in the Cloud: Security Overview, Cloud Security Challenges and Risks, Software-as-a Service Security, Security Governance, Risk Management, Security Monitoring, Security Architecture Design, Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security

**Text Books:**

1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud"O'Reilly
2. Kumar Saurabh, "Cloud Computing, insights into New-Era Infrastructure", Wiley India.
3. RajkumarBuyya, Christian Vecchiola, S.TamaraiSelvi, 'Mastering Cloud Computing", TMGH.

**References:**

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers.
2. John W. Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**BASICS OF JAVA PROGRAMMING**
**(OPEN ELECTIVE I)**

**Course Code: GR22A3072** **L/T/P/C: 3/0/0/3**
**III Year I Semester**

**Course Outcomes:**
1. Apply knowledge on key attributes of Object-Oriented Programming (OOP) and control structures
2. create and manipulate classes and objects, employ various methods and method utilization.
3. Demonstrate expertise in both array-based and string-based structures.
4. understanding of Java's inheritance and interface concepts
5. proficient at organizing Java code using packages and exception handling

**Module I: Fundamentals, Data types, Operators, Control Structures**
**Java Programming Fundamentals**: Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Simple Program, Create Blocks of Code, Keywords, Identifiers, The Java Class Libraries.
**Data Types and Operators**: Java's Primitive Types, Literals, Variables, Scope and Lifetime of Variables, Operators- Arithmetic, Relational, Logical, Bitwise, Assignment. Type conversion in Assignments, Using a Cast, Operator Precedence.
**Program Control Structures**: if, switch, for, enhanced for, while, do-while, break, continue.

**Module II: Introduction to Classes, Objects And Methods**
**Introduction to Classes, Objects and Methods**: Class Fundamentals, Objects creation, Reference Variables and Assignment, Methods, returning a Value, Using Parameters, passing objects to methods, passing arguments, Method Overloading, Constructors, Parameterized Constructors, Overloading Constructors. new Operator, this Keyword, Command-Line Arguments.

**Module III: Arrays and Strings**
**Arrays:** Introduction to Arrays, 1D Arrays, Multidimensional Arrays, Irregular Arrays, Using the Length Member. Arrays class of util package.
**Strings:** String class, constructors, length(), string literals, concatenation, Character extraction, string comparison, searching strings, modifying, data conversion, changing the case, joining, split(). String Buffer class: constructors, length(), capacity(), ensure Capacity(), set Length(), charAt(), setCharAt(), getChars(), append(), insert(), reverse(), delete(), deleteCharAt(), replace().

**Module IV: Inheritance and Interfaces:**
**Inheritance:** Basics, Inheritance Types, Using Super, Multilevel Hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes, Using final.
**Interfaces:** Fundamentals, Creating and Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Extending Interfaces, Nested Interface.

**Module V: Packages and Exception Handling**
Packages: Package Fundamentals, Member Access, Importing Packages, Static import. Exception Handling: Exception Hierarchy, Fundamentals, Handling errors, Multiple Catch, Throwing and Rethrowing an Exception, Throwable, using finally, using throws, Creating Exception Subclasses.

**Text Books:**

1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw Hill, 2017.
2. Herbert Schildt, The Java complete References, 9/e, Tata McGraw Hill,2014.

**Reference Books:**

1. Y. Daniel Liang , An Introduction to JAVA Programming, 10/e, Tata McGraw Hill.
2. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.
3. Balagurusamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DATA WAREHOUSING AND DATA MINING LAB**

**Course Code: GR22A3073** **L/T/P/C: 0/0/4/2**
**III Year I Semester**

**Course Outcomes:**
1. Learn the concept of creating database tables in attribute relation file format(.arff).
2. Design a database tables in .arff format and insert, modify the data.
3. Apply pre-processing statistical methods for any given raw data.
4. Extract knowledge and implementation of various data mining techniques.
5. Implement data mining algorithms in real time problem solving using weka tool.

**Implement the following Tasks using Weka Tool:**

(Solve the tasks 1 to 6 by taking given German credit data as case study)

**The German Credit Data:**

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. Credit dataset (original) Excel Spreadsheet version of the German credit data (Download from web). In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer).A few notes on the German dataset:

- DM stands for Deutsche Mark, the UNIT of currency, worth about 90 centsCanadian (but looks and acts like a quarter).
- Own_telephone: German phone rates are much higher than in Canada, so fewerpeople own telephones.
- Foreign_worker: There are millions of these in Germany (many from Turkey). It isvery hard to get German citizenship if you were not born of German parents.
- There are 20 attributes in judging a loan applicant. The goal is to classify theapplicant into two categories: good orbad.

**TASK 1**

List all the categorical (or nominal) attributes and the real-valued attributes separately. What attributes do you think might be crucial in making the credit assessment? Come up with some simple rules in plain English using your selected attributes. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

**TASK 2**

Suppose you use your above model (task1) trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy? Why or Why not? Check to see if the data shows a bias against "foreign workers" (attribute 20),or "personal-status" (attribute 9). Did removing these attributes have any significant effect? Discuss.

**TASK 3**

Describe what cross-validation is briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?

**TASK 4**

Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. Train your Decision Tree again and report the Decision Tree and cross-validation results.

**TASK 5**

Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model? You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning - Explain this idea briefly. Try reduced error pruning for training your Decision Trees using cross- validation (you can do this in Weka) and report the Decision Tree you obtain? Also, report your accuracyusing the pruned model. Does your accuracy increase?

**TASK 6**

How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one! Can you predict what attribute that might be in this dataset? Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and one R.

**TASK 7**

(a) Create a data set Student.arff with required data.

(b) Demonstrate preprocessing techniques on dataset Student.arff

**TASK 8**

(a) Create a data set Employee.arff by adding required data fields.

(b) Apply Association rule mining on dataset Employee.arff (Use Apriori Algorithm)

**TASK 9**

(a) Create a data set Weather.arff with required fields.

(b) Apply preprocessing techniques on dataset Weather.arff and normalize Weather Tabledata using Knowledge Flow.

**TASK 10**

(a) Demonstrate classification algorithm on dataset student.arff using j48algorithm

(b) Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm

**TASK 11**

(a) Create a data set customer.arff with required fields.

(b) Write a procedure for Clustering Customer data using Simple K-Means Algorithm.

**TASK 12**

Demonstration of clustering rule process on dataset student.arff using simple k-means

**Text Books:**

1. Data Mining– Concepts and Techniques-Jiawei Han&MichelineKamber,Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

**References:**

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, Pearson EdnAsia.
3. www.data.gov.in repository

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**ARTIFICIAL INTELLIGENCE LAB USING PYTHON**

**Course Code: GR22A3074** **L/T/P/C:0/0/3/1.5**
**III Year I Semester**

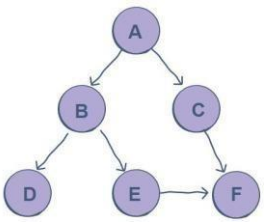
**Course Outcomes:**
1. Apply the methods for implementing algorithms using AI techniques.
2. Understand various search algorithms and gaming applications.
3. Construct the intelligent agents for specific tasks.
4. Understand the knowledge for reasoning.
5. Apply various learning techniques on text and image data.

**List of Experiments / Tasks:**

**TASK1:**
(a) Write down a PEAS (Performance Environment Actuators Sensors)-Description for each of the following agents: (i) Playing football (table soccer), (ii) Shot put athlete, (iii) Playing the 2048 Game (http://gabrielecirulli.github.io/2048)
(b) Characterize the environments of the agents in (a) according to the following criteria: (i) Fully Observable vs. Partially Observable, (ii) Deterministic vs. Stochastic, (iii) Static vs. Dynamic, (iv) Discrete vs. Continuous.

**TASK2:**
Write a program to implement table driven vacuum-cleaner agent.

**TASK3:**




Write a program to implement DFS and BFS for the following diagram.

**TASK4:**
Write a program to implement two player games such as Tic-Tac-Toe game and Game of Nim using easy AI library.

**TASK5:**
Write a program to implement 8 puzzle problem.

**TASK6:**
Write a program to implement A* Algorithm.

**TASK7:**
Write a program to implement Water jug problem.

**TASK8:**
Write a program for Knowledge Representation using Propositional Logic using python logic module. Consider the following sentences:

(a) If it didn't rain, Harry visited Hagrid today,
(b) Harry visited Hagrid or Dumbledore today, but not both,
(c) Harry visited Dumbledore today.
Based on these three sentences, we can answer the question "did it rain today?"

**TASK 9:**
Doctor Black has just been found dead in his mansion yesterday. Yesterday, there were only Three People in Doctor Black's mansion.
They are the prime suspects: 1. Col. Mustard 2. Prof. Plum 3. Ms. Scarlet. Police found Three Weapons in the mansion: 1. Knife 2. Revolver 3. Wrench. The murder has happened in one of the Three Rooms of the mansion:
Ballroom, 2. Kitchen, 3. Library. Find who is the murderer of Dr. Black using implementing propositional logic?

**TASK10:**
Write a program to implement uncertainty using Hidden Markov Model.

**TASK11:**
Write a program to implement Bayes algorithm in the given dataset.

| RID | age | income | student | credit_rating | Class: buys_computer |
|---|---|---|---|---|---|
| 1 | youth | high | no | fair | no |
| 2 | youth | high | no | excellent | no |
| 3 | middle_aged | high | no | fair | yes |
| 4 | senior | medium | no | fair | yes |
| 5 | senior | low | yes | fair | yes |
| 6 | senior | low | yes | excellent | no |
| 7 | middle_aged | low | yes | excellent | yes |
| 8 | youth | medium | no | fair | no |
| 9 | youth | low | yes | fair | yes |
| 10 | senior | medium | yes | fair | yes |
| 11 | youth | medium | yes | excellent | yes |
| 12 | middle_aged | medium | no | excellent | yes |
| 13 | middle_aged | high | yes | fair | yes |
| 14 | senior | medium | no | excellent | no |

Find the class label for the unknown tuple using bayes classifier? X=age=youth, income=medium, student=Yes, Credit_Rating=Fair

**TASK12:**
Write a program for the following:

a. Use Decision Tree and Ensemble Learning Methods to predict the Diabetes in a dataset (Dataset URL: https://archive.ics.uci.edu/ml/datasets/diabetes)
b. Detect the face with Haar Cascade using TensorFlow / PyTorch
c. Explore various Image Processing operations using OpenCV. (For example: Edge Detection, Localizationand Segmentation)

**Text Books:**

1. Artificial Intelligence: A Modern Approach, Staurt Russel, Peter Norvig, 4th Edition, Pearson

**Additional Experiments**

1. Solve the logic programming for the mathematical expression using necessary libraries Hint: pip install kanren, sympy.
2. Demonstrate knowledge representation for the following using open source tools:
   a. Ram likes mango. b. Seemas is a girl. c. Bill likes Cindy. d. Rose is red. e. John owns gold
3. Simulate Rule-Based Response Generation Chatbot use case using Predicate Logic.
4. A person has installed a new alarm system that can be triggered by a burglary or an earthquake. This person also have two neighbors (John and Mary) that are asked to make a call if they hear the alarm. This problem is modeled in a bayesian network with probabilities attached to each edge. Alarm has burglary and earthquake as parents, JohnCalls has Alarm as parent and MaryCalls has Alarm as parent. Build a Bayesian Network todetermine the probability for a burglary if both John and Mary calls.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**R PROGRAMMING LAB**

**Course Code: GR22A2070** **L/T/P/C: 0/0/3/1.5**
**III Year I Semester**

**Prerequisites:**

Basic knowledge in statistics and programming skills.

**Course Outcomes:**
1. Work efficiently in R interactive environment and list arrays, vectors and other concepts
2. Develop and evaluate loop constructs available in R
3. Design logic for arithmetic operations and functions in R
4. Evaluate effectively the descriptive and predictive statistical methods using R.
5. Summarize different kinds of visualization techniques for plotting graphs.

**TASK 1**
Write a R program to create an array of two 3x3 matrices (each with 3 rows and 3 columns) from two given two vectors of any length. And display
(a) the second row of the second matrix of the array
(b) the element in the 3rd row and 3rd column of the 1st matrix.

**TASK 2**
(a) Find sum, mean and product of given vector values.
(b) Write R program to find the given number is prime or not.

**TASK 3**
(a) Write R program for implementation of built-in functions.
(b) Write R program to find the factors of a given number using functions.

**TASK 4**
(a) Write R program to generate Fibonacci series using recursive function.
(b) Write R program to find the sum of natural numbers using recursive function.

**TASK 5**
Write a R program to create a list of random numbers in normal distribution and count the occurrencesof each value.

**TASK 6**
(a) Write a R program for addition of two matrices.
(b) Write a R program for multiplication of two matrices.

**TASK 7**
Write a R program to create a data frame from four given vectors of students details. (Name, roll.no.,sub_name, marks)

**TASK 8**
Write a R program to create a Data Frame which contain details of 5 employees and display summaryof the data.

**TASK 9**
Write a R program to implement Data preprocessing techniques.

**TASK 10**
Write a R programto read the .csv file and perform the following.
(a) Plot the data using using ggplot (b) Test a hypothesis about the data

**TASK 11**
(a) Use the R -Studio environment to code OLS models
(b) Review the methodology to validate the model and predict the dependent variable for a set of givenindependent variables
(c) Use R graphics functions to visualize the results generated with the model

**Task 12**
(a) Use R -Studio environment to code Logistic Regression models
(b) Review the methodology to validate the model and predict the dependent variable for a set of givenindependent variables.
(c) Use R graphics functions to visualize the results generated with the regression model

**Text Books:**
1. Efficient R Programming, A practical guide to smarter programming, Colin Gillespie, RobinLovelace; Publisher: O'Reilly Media, 1 edition.
2. The Art of R Programming: A Tour of Statistical Software Design, by Norman Matlof, 1st Edition.
3. Hands-On Programming with R: Write Your Own Functions and Simulations 1st Edition, by GarrettGrolemund (Author), Hadley Wickham (Foreword), Kindle Edition.

**Reference Books:**
1. R Commands - Quick Reference
2. Surviving LINUX - Quick Reference

# III YEAR
# II SEMESTER

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**MACHINE LEARNING**

**Course Code: GR22A3140** **L/T/P/C: 3/0/0/3**
**III Year II Semester**

**Prerequisites:**

1. Mastery of introduction-level algebra, statistics, and probability theory
2. Fundamental knowledge on data modeling and evaluation

**Course Outcomes:**

1. Explain the concepts machine learning models and able to perform feature engineering techniques.
2. Identify and apply appropriate supervised learning models.
3. Design neural network models for the given data.
4. Perform evaluation on machine learning algorithms and model selection techniques.
5. Devise un-supervised and reinforcement learning models.

**UNIT-I**

**Introduction:** Introduction to machine learning, Supervised learning, Unsupervised learning, Semi-supervised learning, Reinforcement learning, Deep learning, Concept learning using find-S algorithm.

**Feature Engineering:** Feature Selection using Filter, Wrapper, Embedded methods, and Feature normalization using min-max normalization, z-score normalization, and constant factor normalization,

**Introduction to Dimensionality Reduction:** Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) techniques.

**UNIT-II**

**Supervised Learning – I (Regression and Classification)**

**Regression models:** Simple linear regression, Multiple linear regression. Cost Function, Gradient Descent, Performance Metrics: Mean Absolute Error (MAE), Mean Squared Error (MSE), R-Squared error, Adjusted R Square.

**Classification models:** Decision Trees-ID3, CART, Naive Bayes, K-Nearest-Neighbours (KNN), Logistic regression, Multinomial logistic regression, Support Vector Machines (SVM).

**UNIT-III**

**Supervised Learning – II (Classification with Neural Networks)**

**Neural Network Representation:** Introduction to Artificial Neural Networks (ANN), Activation Functions, Perceptron and Back Propagation algorithms.

**Convolutional Neural Networks** - Convolution and Pooling layers, Recurrent NeuralNetworks(RNN).

**Classification Metrics**: Confusion matrix, Precision, Recall, Accuracy, F-Score, ROC curves

**UNIT-IV**

**Model Validation in Classification:** Cross Validation - Holdout Method, K-Fold, StratifiedK-Fold, Leave-One-Out Cross Validation (LOOC-V).

Bias-Variance tradeoff, Regularization, Overfitting, Underfitting.

**Ensemble Methods:** Boosting, Bagging, Random Forest classifier.

**UNIT-V**

**Unsupervised Learning:** K-means, K-Modes, K-Prototypes, Gaussian Mixture Model clusteringalgorithms, Expectation-Maximization, BIRCH clustering algorithms.
**Reinforcement Learning**: Exploration and exploitation trade-offs, non-associative learning, Markov decision processes, Q-learning.

**Text Books:**

1. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kaufmann (2nd Edition).
2. Machine Learning – Tom M. Mitchell, TMGH.
3. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar (Second Edition).

**References:**

1 Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2 R. S. Sutton and A. G. Barto. Reinforcement Learning - An Introduction. MIT Press,1998.
3 Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
4 Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.
5 Machine Learning Yearning, Andrew Ng.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**BIG DATA ANALYTICS**

**Course Code: GR22A3143** **L/T/P/C: 3/0/0/3**
**III Year II Semester**

**Pre - Requisites:**

Students should have knowledge of one Programming Language (Java/ Python), thorough practice of SQL, and exposure to Linux/ UNIX Environment.

**Course Outcomes:**
1. Interpret the need for HDFS in processing big data.
2. Examine the purpose of data ingestion tools in Big Data Systems.
3. Implement distributed processing of big data using Map Reduce or Pig.
4. Compose Queries with Hive or HBase to analyze the data.
5. Inspect the components of Apache Spark to perform in memory processing.

**UNIT - I**
**Introduction to Big Data and Hadoop:**
Types of Digital Data, Definition of Big Data, V's of Big Data, Advantages of Big Data, Characteristics of Hadoop, RDBMS Vs Hadoop, Ecosystem components of Hadoop, Big Data Analytics Pipeline, Hadoop Distributions, Need for HDFS, Characteristics of HDFS, HDFS Components, HDFS High Availability Architecture, Block Replication Method, Rack Awareness, HDFS Commands.

**UNIT - II**
**Data Ingestion into Big Data Systems and ETL:**
Big Data Ingestion Tools, Apache Sqoop, Benefits of Apache Sqoop, Sqoop Connectors, Importing and Exporting to and from Hadoop using Sqoop, Limitations of Sqoop, Apache Flume Model, Data Sources for FLUME, Components of FLUME Architecture.

**UNIT - III**
**Distributed Processing - Map Reduce and PIG:**
Need for YARN, Elements of YARN Architecture, Characteristics of Map Reduce, Phases of Map Reduce with an Example, Anatomy of MR Job Run with YARN, Handling Failures, Task Execution, Map Reduce Input and Output Formats, Shuffle and Sort, Joins in Map Reduce, Introduction to PIG, Components of PIG, Data Types in PIG – Simple and Complex, PIG Execution Modes, PIG Interactive Modes, Comparison of PIG with databases, Data Processing Operators.

**UNIT - IV**
**Apache Hive and NOSQL Database - HBase:**
Features of HIVE, HIVE Architecture, HIVE Metastore, Datatypes in HIVE, HIVEQL, Tables, File Format Types–Text, Sequence, AVRO, Parquet, Querying Data, Types of NOSQL Database, Characteristics of HBASE, Architecture, HBase Vs RDBMS, HBASE Shell Commands.

**UNIT - V**

**Apache Spark:**

Functional Programming, Components of Apache Spark, Applications of in - memory processing, Hadoop Ecosystem Vs. Spark, Spark Architecture, RDDs in Spark, SparkSQL, Architecture of SparkSQL, DataFrames, Data Analytics, Types of Analytics.

**Text Books:**

1. Tom White “Hadoop: The Definitive Guide”4thedition, O’reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

**References:**

1. MichaelBerthold,DavidJ.Hand,"Intelligent DataAnalysis”,Springer,2007.
2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRCpress(2013)
3. Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big DataAnalyticswithOracleREnterpriseandOracleRConnectorforHadoop”, McGraw-Hill/Osborne Media(2013),Oracle press.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# SOFTWARE ENGINEERING

**Course Code: GR22A3052** **L/T/P/C: 3/0/0/3**
**III Year II Semester**

**Course Outcomes**:
1.Understand business requirements and choose a relevant Process model for a given software proposal.
2. Analyze the requirements to prepare SRS.
3. Model various Architectural Designs for a software project.
4. Develop various functional and structural test cases for a software module.
5. Estimate the Cost and Schedules of a Software Project.

## UNIT I

**Introduction to Software Engineering:** The evolving role of software, Changing Nature of Software, Software myths.

**A Generic view of process:** Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.

**Process models:** The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

## UNIT II

**Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

**Requirements engineering process:** Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

## UNIT III

**Design Engineering:** Design process and Design quality, Design concepts, the Design model. **Creating an architectural design:** Software architecture, Data design, Architectural Styles and Patterns, Architectural Design.

**Performing User interface design:** Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation.

## UNIT IV

**Testing Strategies:** A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.

**Product metrics:** Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.

**Metrics for Process and Products:** Software Measurement, Metrics for software quality.

**UNIT V**

**Risk management:** Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

**Quality Management :** Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

**TEXT BOOKS**

1. Software Engineering, A practitioner's Approach- Roger S.Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.

**REFERENCES**

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers.
2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.
3. Systems Analysis and Design- Shely Cashman Rosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SOFTWARE ARCHITECTURE**
**(PROFESSIONAL ELECTIVE - II)**

**Course Code: GR22A3119** **L/T/P/C: 3/0/0/3**
**III Year II Semester**

**Pre requisites:**

Students are expected to have knowledge in Operating Systems, Object Oriented Programming.

**Course Outcomes**:
1. Articulate the features of software architecture for large scale software systems.
2. Implement the major software architectural styles, design patterns, and frameworks.
3. Interpret the documentation approaches and architectural description languages.
4. Deduce the architectural alternatives for a problem and select among them.
5. Analyze various software architecture paradigms for designing new system.

**UNIT I**

**Introduction To Software Architecture:** An Engineering Discipline for Software, Status of S/W Architecture, Architecture Business Cycle, Where do Architectures come from? Software Processes and the Architecture Business Cycle, Features of Good Architecture.

**UNIT II**

**Designing the Architecture with Styles:** Architecture in the Life Cycle, Designing the Architecture, Formatting the Team Structure, Creating a Skeletal System.

Architecture Styles: Pipes and Filters, Data Abstraction and Object Oriented Organization, Event- Based,Implicit Invocation, Layered Systems, Repositories, Interpreters.

**UNIT III**

**Creating an Architecture-I:** Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attribute, Scenarios in Practice, Other System Quality Attributes, Business Qualities, Architecture Qualities.

Achieving Qualities: Introducing Tactics, Availability Tactics, Modifiability Tactics, Performance Tactics, Security Tactics, Testability Tactics and Usability Tactics.

**UNIT IV**

**Creating an Architecture-II:** Documenting Software Architectures, Use of Architectural Documentation, Views, Choosing the Relevant Views, Documenting a view, Documentation across Views.

Reconstructing Software Architecture: Introduction, Information Extraction, Database Construction, View Fusion, and Reconstruction.

**UNIT V**

**Analyzing Architectures**: The ATAM-Participants in the ATAM, Outputs of the ATAM,

Phases of the ATAM. The CBAM: Decision-Making Context, the Basis for the CBAM, Implementing the CBAM.A Case study in Interoperability- Relationship to the Architecture Business Cycle, Requirements and Qualities, Architecture Solution, Achieving Quality Goals.

**Text Books:**

1. Software Architectures in Practice, Len Bass, Paul Clements, Rick Kazman, 2ndEdition, PearsonPublication.
2. Software Architecture, Mary Shaw and David Garlan, First Edition, PHI Publication, 1996.

**References:**

1. Software Design: From Programming to Architecture, Eric Braude, Wiley,2004.
2. N. Domains of Concern in Software Architectures and Architecture Description Languages,Medvidovic and D. S. Rosenblum. USENIX

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DATA VISUALIZATION**
**(Open Elective II)**

**Course code: GR22A3076** **L/T/P/C:3/0/0/3**
**III Year II Semester**

**Course Outcomes:**
1. Apply the visualization process for creating visual representations.
2. Learns the tableau terminologies and its fields.
3. Explores tableau prep tool for visualization
4. Classify visualization techniques for different types of data and
5. Summarize the recent trends in visualization techniques and Apply visualization techniques for GIS , maps . their applications for realworld problems.

**UNIT I**
Introduction to Visualization, Visualization process, visual representation of data, Gestalt principles, information overloads. Creating visual representations, visualization reference model, visual mapping, visual analytics, Design of visualization applications.

**UNIT II**
Introduction to Tableau: Tableau Architecture, Tableau Server Architecture VizQL, Foundations for building visualizations Measures and dimensions, Visualizing data: Bar charts, Iterations of bar charts for deeper analysis, Line charts, Geographic visualization, Using Show Me, Putting everything together in a dashboard, The dashboard interface, Building your dashboard, , Connecting to Data in Tableau , Managing data source metadata, Working with extracts instead of live connections, Filtering data, Understanding the Tableau Data Model, Joins, and Blends, Structuring Messy Data to Work Well in Tableau. Telling a Data Story with Dashboards

**UNIT III**
**Tableau Prep Builder:**
Introduction to Tableau Prep,Tableau Prep Builder User Interface, Data Preparation techniques using Tableau Prep Builder tool, Flowing with the fundamental paradigm: Connecting to data, Cleaning the data, Unioning, merging mismatched fields, and removing unnecessary fields, Grouping and cleaning, Calculations and aggregations in Tableau Prep: Row-level calculations, Level of detail calculations, Aggregation, Filtering data in Tableau Prep, Transforming the data for analysis, Options for automating flows

**UNIT IV**
Classification of visualization systems, Interaction and visualization techniques misleading, Visualization of one, two and multi-dimensional data, text and text documents. Visualization of groups, trees, graphs, clusters, networks, Metaphorical visualization.

**UNIT V**
Visualization of volumetric data, vector fields, Visualization of maps, geographic

information, GIS systems

Perception: Pre attentive Properties ,Color ,Form ,Spatial Position , Advanced visualization: Slope charts and bump charts, Waterfall charts, Step lines and jump lines, Spark lines, Dumbbell charts, Unit/symbol charts, Marimekko chart, Animated visualizations

**Text Books:**

1. Matthew Ward Georges Grinstein Daniel Keim , Interactive Data Visualization: Foundations, Techniques, and Applications. A K Peters, Ltd. Natick.
2. Learning Tableau 2020: Create effective data visualizations, build interactive visual analytics, and transform your organization, 4th Edition, 2020
3. Riccardo Mazza, Introduction to Information Visualization, Springer London, Published: 02 April 2009,eBook ISBN978-1-84800-219-7

**Reference Books:**

1. A Practitioner's Guide to Tableau Prep Builder. USEReady.
2. Hand book of data visualization ,chun-houh chen,wolfgang hardle,Antonyunwin

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**DATA SCIENCE WITH R PROGRAMMING**

**(OPEN ELECTIVE II)**

**Course Code: GR22A2086** **L/T/P/C: 3/0/0/3**

**III Year II Semester**

**Course Outcomes:**

Use R environment, data structures, functions, to solve statistical problems

1. Analyse basic and descriptive statistical analysis methods using R
2. Apply data collection , preparation, visualization and feature engineering with R
3. Summarize data analysis and machine learning techniques with R
4. Implement R advanced features for real time business case studies

**UNIT I**

**Introduction to R -** R Windows Environment, R-Data types,R-Data Structures,R Functions and loops, Reading Datasets, Working with different file types, R packages. Introduction to statistical learning and R-Programming,Overview of CRAN.

**UNIT II**

**Descriptive Statistics**- Measures of central tendency, Measures of location of dispersions, Practice and analysis with R.

**Basic Statistical Analysis** - Statistical hypothesis generation and testing, Chi-Square test, t-Test, Analysis of variance, Correlation analysis, Maximum likelihood test, Practice and analysis with R.

**UNIT III**

**Introduction to Data Science**:Data Science Terminology, Data Science Process, Data Science Project Roles.

**Data Collection and Management**: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.
Data Preparation, Feature Engineering, Data Visualization in R.

**UNIT IV**

**Data Analysis techniques** - Exploratory data analysis, Association rules analysis, Regression analysis, Classification techniques, Clustering, Practice and analysis with R **Model Evaluation** - Machine Learning concepts, types of machine learning, Machine learning with R.

**UNIT V**

**Advanced R Programming –** Data Models, PCA, LDA, Exploratory fact Analysis, NN Modeling with R.

**Business Case studies and projects** -Understanding business scenarios, scalable and parallel computing with Hadoop and Map-Reduce, Sensitivity Analysis.

**Text Books:**

1. Probability & Statistics for Engineers & Scientists (9th Edn.), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Prentice Hall Inc.
2. The Elements of Statistical Learning, Data Mining, Inference, and Prediction(2nd Edn.),

Trevor Hastie Robert Tibshirani Jerome Friedman, Springer, 2014
3. An Introduction to Statistical Learning: with Applications in R, G James, D. Witten,T Hastie, and R. Tibshirani, Springer, 2013

**Reference Books:**

1. Advances in Complex Data Modeling and Computational Methods in Statistics, Anna Maria Paganoni and Piercesare Secchi, Springer, 2013
2. Data Mining and Analysis, Mohammed J. Zaki, Wagner Meira, Cambridge, 2012
3. Hadoop: The Definitive Guide (2nd Edn.) by Tom White, O'Reilly, 2014
4. MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems, Donald Miner, Adam Shook, O'Reilly, 2014

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**BLOCKCHAIN TECHNOLOGY**

**(PROFESSIONAL ELECTIVE –II)**

**Course Code: GR22A3146** **L/T/P/C: 3/0/0/3**

**III Year II Semester**

**Course Outcomes:**

1. Summarize the fundamental concepts of Blockchain, Consensus mechanism and Cryptocurrency.
2. Illustrate the application of public blockchain system and smart contract in industry.
3. Comprehend the characteristics of private blockchain, consortium blockchain and Initial Coin Offering Platforms.
4. Demonstrate the security, privacy challenges and applications of blockchain .
5. Develop blockchain programs using Python and Hyperledger Fabric for real time applications.

**UNIT-I**

**Fundamentals of Blockchain:** Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain,The Technology and the Future.

**Blockchain Types and Consensus Mechanism**: Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol.

**Cryptocurrency – Bitcoin, Altcoin and Token:** Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

**UNIT-II**

**Public Blockchain System:** Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

**Smart Contracts:** Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

**UNIT-III**

**Private Blockchain System:** Introduction, Key Characteristics of Private Blockchain, Why We Need Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

Consortium Blockchain: Introduction, Key Characteristics of Consortium Blockchain, Why We Need Consortium Blockchain, Hyperledger Platform, Overview of Ripple, Overview of Corda. Initial Coin Offering: Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

**UNIT-IV**

**Security in Blockchain:** Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges ofBlockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

**Applications of Blockchain:** Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

**UNIT-V**

**Blockchain Case Studies:** Case Study 1 – Retail, Case Study 2 – Banking and Financial Services, Case Study 3 – Healthcare, Case Study 4 – Energy and Utilities.

**Blockchain Platform using Python**: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

**Blockchain platform using Hyperledger Fabric:** Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

**Text books:**

1. “Blockchain Technology”, Chandramouli Subramanian, Asha A.George, Abhilash K A andMeena Karthikeyan, Universities Press.

**Reference books:**

1. Blockchain Blueprint for Economy, Melanie Swan, SPD O'reilly.
2. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gaur, Pearson Addition Wesley.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**INTRODUCTION TO DBMS**

**(OPEN ELECTIVE)**

**Course Code: GR22A3141** **L/T/P/C: 3/0/0/3**

**III Year II Semester**

**Course Outcomes:**

At the end of the course, the student will be able to

1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

**UNIT I**

**Introduction to Database And System Architecture:** Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages-DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

**UNIT II**

**Introduction to Database Design:** ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

**Relational Model:** Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra

**UNIT III**

**SQL Queries and Constraints:** SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying / Altering Tables and Views, Cursors, Triggers.

**UNIT IV**

**Schema Refinement and Normal Forms:** Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Reasoning about FD, Normal Forms,

**UNIT V**

**Transaction Management:** Transaction Concept, Transaction State, Concurrent Executions, Serializability,Testing for Serializability.

**Concurrency Control:** Lock based Protocols, Timestamp based protocols,

**Recovery System:** Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets

- Assignments

**Text Books**

1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke,TATA McGraw Hill 3rdEdition
2. "Data base System Concepts", Silberschatz, Korth, McGraw hill, V Edition.
3. "Introduction to Database Systems", C.J.DatePearsonEducation.

**References:**

1. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.
2. "Database Management System", ElmasriNavate, PearsonEducation.
3. "Database Management System", Mathew Leon,Leo

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# MACHINE LEARNING LAB

**Course Code: GR22A3142** **L/T/P/C: 0/0/3/1.5**
**III Year II Semester**

**Prerequisites:**

1. Mastery of introduction-level algebra, statistics, and probability theory
2. Proficiency in basic programming skills and coding experience in Python or R programming

**Course Outcomes:**

1. Illustrate the applications of python's machine learning libraries.
2. Apply dimensionality reduction techniques in machine learning applications.
3. Design and analyze various supervised learning mechanisms.
4. Develop back propagation and Random Forest algorithms.
5. Design and analyze various unsupervised learning algorithms.

**Task 1**
Write a python program to import and export data using Panda's library functions.

**Task 2**
Demonstrate various data preprocessing techniques for a given dataset.

**Task 3**
Implement dimensionality reduction using Principal Component Analysis (PCA) method

**Task 4**
Write a python program to demonstrate various Data Visualization Techniques.

**Task 5**
Implement Simple and Multiple Linear Regression models

**Task 6**
Develop Logistic Regression model for a given dataset

**Task 7**
Develop Decision Tree classification model for a given dataset and use it to classify a new sample.

**Task 8**
Implement Naïve Bayes Classification in Python for a given dataset.

**Task 9**
Build KNN Classification model in python for a given dataset.

**Task 10**
Implement Back propagation model in python for a given dataset.

**Task 11**

a) Implement Random Forest classification method in python for a given dataset.
b) Implement Boosting ensemble method on a given dataset.

**Task 12**

a) Write a python program to implement K-Means clustering algorithm.
b) Write a python program to implement the BIRCH algorithm.

**Reference Books:**

1. Python Machine Learning by Sebastian Raschka, Oreilly Publishers
2. Machine Learning – Tom M. Mitchell, -MGH
3. Data Mining–Concepts and Techniques -Jiawei Han and Micheline Kamber, Morgan Kaufmann
4. Introduction to Data Mining - Michael Steinbach, Pang-Ning Tan, and Vipin Kumar (Second Edition).
5. Christopher Bishop, Pattern Recognition and Machine Learning, Springer.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# BIG DATA ANALYTICS LAB

**Course Code: GR22A3148** **L/T/P/C: 0/0/3/1.5**
**III Year II Semester**

**Course Outcomes:**

1. Understand Hadoop working environment.
2. Apply Map Reduce programs for real world problems.
3. Implement scripts using Pig to solve real world problems.
4. Analyze queries using Hive to analyze the datasets
5. Understand spark working environment and integration with R

**TASK 1**
Practice basic HDFS commands in Hadoop environment.

**TASK 2**
a) Ingest structured data using Apache Sqoop.
b) Ingest structured and unstructured data using Flume.

**TASK 3**
a) Write a word count program to simulate the Map Reduce Paradigm.
b) Write a Map Reduce program to perform matrix multiplication.

**TASK 4**
Implement a Map Reduce program to mine and analyze weather data set.

**TASK 5**
Write a Pig Latin script to sort, group, join, project, and filter the data.

**TASK 6**
a) Develop a pig Latin script to count the number of words in a text file.
b) Develop a pig Latin script to find maximum temperature across all the years usingweather data set.

**TASK 7**
Create User Defined Functions/Eval functions in Pig to handle unwanted data duringdata processing.

**TASK 8**
Use Hive to create, alter, and drop databases, tables and views.

**TASK 9**
Practice User Defined functions and indexes using Hive.

**TASK 10**
Write HBase queries to handle databases.

**TASK 11**
Develop a program in Spark framework for processing of large datasets.

**TASK 12**
Practice on SparkSQL environment.

**Text Books**

1. Tom White, “Hadoop: The Definitive Guide”, 4th Edition, O’Reilly Inc,2015.
2. Tanmay Deshpande, “Hadoop Real-World Solutions Cookbook”, 2ndEdition, Packt Publishing, 2016.

**Reference**

1. Edward Capriolo, Dean Wampler, and Jason Rutherglen, “Programming Hive”, O’Reilly Inc, 2012.
2. Vignesh Prajapati, “Big data Analytics with R and Hadoop”, Packt Publishing, 2013.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**MINI PROJECT WITH SEMINAR**

**Course Code: GR22A3089** **L/T/P/C: 0/0/4/2**
**III Year II Semester**

**Course Outcome:**
At the end of this course, students will be able to:
1. Make use of fundamental knowledge and practical knowledge to implement towards industries.
2. Utilizing software and design, analyze the engineering Knowledge in accordance with applicable standards.
3. Analyze project management skills and scheduling of work in stipulated time.
4. Evaluate and demonstrate the problem finding ability in Engineering Technologies.
5. Develop technical information by means of written and oral reports.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## CONSTITUTION OF INDIA

**CourseCode: GR22A2003** **L/T/P/C: 2/0/0/0**
**III Year II Semester**

**Course Outcomes:**

1. Students will be able to know the importance of Constitution and Government
2. Students will be able to become Good Citizens and know their fundamental rights, duties and principles.
3. Students will learn about the role of PM, President, Council of Ministers etc and it will help students learn about Local Administration.
4. The students understand the importance of Election Commission and the Students will become aware of how a Country and State are run in Democracy.
5. They will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, SpecialStatus of States etc.,

**Unit I: Introduction: Constitution'** meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

**Unit II: Union Government and its Administration:** Structure of the Indian Union: Federalism, Centre -State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

**Unit III:**
**State Government and its Administration:** Governor: Role and Position, CM and Council ofministers, State Secretariat: Organization, Structure and Functions

**Unit IV:**
Local Administration: District Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials.

**Unit V: Composition of Judiciary and Election Commission:** Composition of Indian Judiciary, Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC.

**Books Recommended:**

1. 'Indian Polity' by Laxmikanth 5th Edition, McGraw Hill Edition.
2. Indian Constitution by Subhash C. Kashyap, Vision Books Publisher
3. 'Introduction to Indian Constitution' by D.D. Basu, 21st Edition, LexisNexis Publisher
4. *'Indian* Administration *by Avasthi* and Avasthi-by Lakshminarainagarwal publication

# IV YEAR
# I SEMESTER

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**CRYPTOGRAPHY AND NETWORK SECURITY**

**Course Code: GR22A4048** **L/T/P/C: 3/0/0/3**
**IV Year I Semester**

**Pre-Requisites:**

Students should have good knowledge in Computer Networks

**Course Outcomes:**
1. Summarize the security attacks, services and mechanisms.
2. Apply various public key and private key cryptographic algorithms for encryption and decryption.
3. Articulate the issues and structure of Authentication Service and Electronic Mail Security.
4. Interpret the IP Security Architecture, Web Security and Key Management techniques.
5. Analyze intrusion detection, Web security, firewalls.

**UNIT I**

Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) Security Mechanisms, a model for Internetwork security.

**UNIT II**

Conventional Encryption Principles, substitution ciphers, transposition ciphers. Conventional encryption algorithms (DES, Blowfish, Idea), cipher block modes of operation, location of encryption devices, key distribution.

Public key cryptography principles, public key cryptography algorithms (RSA, Diffie-Hellman, ECC), digital signatures, digital certificates, certificate authority and key management.

**UNIT III**

Approaches of Message Authentication, Secure Hash Functions (MD-5,SHA-1) and HMAC. Kerberos, X.509 Directory Authentication Service.

Email privacy: Pretty Good Privacy (PGP), MIME,S/MIME.

**UNIT IV**

**IP Security Overview,** IP Security Architecture, Authentication Header, Encapsulating Security

Payload,CombiningSecurityAssociations and Key Management, Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET).

**UNIT V**

Basicconcepts of SNMP, SNMPv1 Community facility and SNMPv3, Intruders, Viruses and related threats, firewall Design principles, Trusted System, Intrusion Detection Systems.

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections,

Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

**Text Books:**

1. Cryptography and Network Security Principles and Practice, Global Edition, Eighth Edition, William Stallings, Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and RyanPermeh, wiley Dreamtech.

**References:**

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press).
2. Network Security - Private Communication in a Public World by Charlie Kaufman,Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes,TMH
5. Introduction to Cryptography, Buchmann, Springer.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**NEURAL NETWORKS AND DEEP LEARNING**

**Course Code: GR22A3118** **L/T/P/C: 3/0/0/3**
**IV Year I Semester**

**Prerequisites:**

The subject of Neural Networks & Deep Learning requires strong mathematical concepts of probability, statistics, matrices and a course on Artificial Intelligence is expected to be completed by the student.

**Course Outcomes:**

1. Summarize the working of basic ANN models and Supervised Learning Models
2. Apply different unsupervised learning networks that can be used to solve a problem.
3. Compare the working of ANN models and Deep learning models in selecting a network for solution.
4. Evaluate Parameter Regularization Procedure in Deep Neural network.
5. Design various Deep learning optimization algorithms for real-time applications.

**UNIT I**

**Artificial Neural Networks -** Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. BAM and Hopfield Networks.

**UNIT II**

**Unsupervised Learning Network-** Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

**UNIT III**

**Introduction to Deep Learning**: Historical Trends in Deep learning, Deep Feed - forward networks, Gradient- Based learning, Hidden Units, Architecture Design, Back- Propagation and Other Differentiation Algorithms, Transfer learning.

**UNIT IV**

**Regularization for Deep Learning:** Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations

**UNIT V**

**Optimization for Train Deep Models:** Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates.
**Applications:** Large-Scale Deep Learning, Computer Vision, Image classification, Speech

Recognition, Natural Language Processing, GANS

**Text Books**

1. Deep Learning –Ian Good fellow, Yoshua Bengio, Aaron Courville — MIT Pressbook-ISBN-13: 978- 0262035613,
2. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

**References**

1. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd2005
2. Neural Networks in Computer Intelligence, Li Mm Fu TMH2003
3. Deep Learning Fundamentals: An Introduction for Beginners by Chao Pan , AI Sciences Publisher.
4. Pattern Recognition and Machine Learning - Christopher M. Bishop -Information Science and Statistics.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**COMPILER DESIGN**

**(PROFESSIONAL ELECTIVE –III)**

**Course Code: GR22A4078** **L/T/P/C: 3/0/0/3**

**IV Year I Semester**

**Course Outcomes:**

1. Understand the basic concepts of compiler design, and its different phases.
2. Understand the different types of parsing techniques and should be in a position to solve the problem.
3. Analyze the program and minimize the code by using optimizing techniques which helps in reducing the number of instructions in a program and also utilization of registers in an effective way.
4. Learn the process of translating a modern high-level language to executable code.
5. Construct new tools for compilation for small programming languages.

**UNIT I**

**Overview of Compilation:** Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and phases of translation, interpretation, bootstrapping, data structures in compilation – LEX/ lexical analyzer generator.

**UNIT II**

**Top down Parsing:** Context-free grammars, Top down parsing – Backtracking, LL(1), Recursive Descent Parsing, Predictive parsing, preprocessing steps required for predictive parsing.

**Bottom up Parsing:** Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser/ generator.

**UNIT III**

**Semantic Analysis:** Intermediate forms of source programs – abstract syntax tree, polish notation and three address codes. Attributed Grammars, Syntax Directed Translation, Conversion of popular programming languages constructs into Intermediate code forms, Type checker.

**Symbol Tables:** Symbol table format, organization for block structures languages, hashing, tree structures representation of scope information.

**UNIT IV**

**Block Structure and Non-Block Structure Storage Allocation:** Static, Runtime stack and heap storage allocation, storage allocation for arrays, strings and records.

**Code Optimization:** Consideration for optimization, scope of optimization, local optimization, loop optimization, frequency reduction, folding, DAG representation.

**UNIT V**

**Data Flow Analysis:** Flow graph, data flow equation, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation. **Object Code Generation:** Object code forms, machine dependent code optimization, register allocation and assignment, generic code generation algorithms, DAG for register allocation.

**Text Books:**

1. Principles of Compiler Design -A.V. Aho,J.D.Ullman, Pearson Education.
2. Modern Compiler Implementation in C-Andrew N. Appel, Cambridge University Press.

**References:**

1. Lex&Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Modern Compiler Design- Dick Grune, Henry E.Bal,CarielT. H.Jacobs, Wiley dreamtech.
3. Engineering a Compiler-Cooper & Linda, Elsevier.
4. Compiler Construction- Louden, Thomson

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**IMAGE AND VIDEO PROCESSING**

**(PROFESSIONAL ELECTIVE –III)**

**Course Code: GR22A4051** **L/T/P/C:3/0/0/3**
**IV Year I Semester**

**Pre requisites:**

Students are expected to have knowledge in
1. Analysis of algorithms and linear algebra.
2. Programming experience.

**Course Outcomes:**
1. Summarize the basic principles of image processing and transformations.
2. Organize the image enhancement and segmentation methods.
3. Apply image compression techniques on images.
4. Outline the basic steps of video processing.
5. Implement the 2-D motion Estimation techniques.

**UNIT I**

**Fundamentals of Image Processing and Image Transforms:** Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

**UNIT II**

**Image Enhancement:** Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, Image smoothing, Image sharpening, Selective filtering.

**Image Segmentation:** Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

**UNIT III**

**Image Compression:** Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy& Lossless, Huffman coding, Bit plane coding,Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

**UNIT IV**

**Basic Steps of Video Processing:** Analog Video, Digital Video. Time-Varying Image Formation models: Three Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, filtering operations.

**UNIT V**

**2-DMotion Estimation:** Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Application of motion estimation in Video coding.

**Text Books:**

1. Digital Image Processing – Gonzalez and Woods, 3rd Ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Oysterman and Ya–quinZhang. 1st Ed., PH Int.

**References:**

1. Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – Scotte Umbaugh, 2nd Ed, CRCPress, 2011.
2. Digital Video Processing – M. Tekalp, Prentice Hall International
3. Digital Image Processing with MATLAB and Lab view – VipulaSingh,Elsevier
4. Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5thEd.,Elsevier.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**NATURAL LANGUAGE PROCESSING**

**(PROFESSIONAL ELECTIVE –III)**

**Course Code: GR22A4079** **L/T/P/C:3/0/0/3**

**IV Year I Semester**

**Prerequisites:**

Students are expected to have knowledge in Formal Languages and Automata Theory, Compiler Design.

**Course Outcomes:**

1. Summarize the role of natural language processing in various applications and explain language modelling.
2. Analyze information retrieval systems and utilize lexical resources for processing natural language text.
3. Apply word level analysis and syntactic analysis on natural language processing.
4. Demonstrate semantic analysis on natural language processing and Discuss discourse processing of text.
5. Illustrate the automation of natural language generation and machine translation of Indian languages.

**UNIT I**

Overview: Origins and challenges of NLP, Language and Grammar, Processing Indian Languages, NLP Applications, Information Retrieval.

Language Modeling: Introduction, Various Grammar-based Language Models, Statistical Language Model.

**UNIT II**

**Information Retrieval:** Introduction, Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, Evaluation

**Lexical Resources:** Introduction, WordNet, Frame Net, Stemmers, POS Tagger, Research Corpora.

**UNIT III**

**Word Level Analysis:** Introduction, Regular Expressions, Finite State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part of Speech Tagging,TF, IDF.

**Syntactic Analysis:** Introduction, Context-free Grammar, Constituency, Parsing, Probabilistic Parsing.

**UNIT IV**

Semantic Analysis: Introduction, Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation.

Discourse Processing: Introduction, Cohesion, Reference Resolution, Discourse Coherence and Structure

**UNIT V**

**Natural Language Generation:** Introduction, Architecture of NLG Systems, Generation Tasks andRepresentations, Application of NLG.

**Machine Translation:** Introduction, Problems in Machine Translation, Characteristics of IndianLanguages, Machine Translation Approaches, Translation involving Indian Languages.

**Textbooks:**

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

**References:**

1 Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.

2 James Allen, Bejamin/cummings, "Natural Language Understanding", 2ndedition,1995.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**AGILE METHODOLOGIES**

**(PROFESSIONAL ELECTIVE –III)**

**Course code: GR22A4127** **L/T/P/C: 3/0/0/3**

**IV Year I Semester**

**Prerequisites:**

Students are expected to have knowledge in principles of software engineering

**Course Outcomes:**

1. At the end of the course the student will be able to explain fundamentals of Agile methodology.
2. Perform iterative software development processes: how to plan them, how to execute them.
3. Develop techniques and tools for improving team collaboration and software quality.
4. Perform Software process improvement as an ongoing task for development teams.
5. Show how agile approaches can be scaled up to the enterprise level.

**UNIT I**

Introduction: Agile Definition, Why Agile, how to be Agile, Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model – Classification of Agile Methods, Understanding XP, Values and Principles, Improve the Process, Eliminate Waste, Deliver Value. Scrum and Self-Organizing Teams: Scrum, Scrum process flow, Scrum Roles, The Rules of Scrum, everyone on a Scrum Team Owns the Project.

**UNIT II**

Practicing XP: Thinking, Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

**UNIT III**

Releasing: Done, Production-Ready Software, No Bugs, Version Control, Concurrent Editing, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**UNIT IV**

Planning: Vision, Release Planning, Risk Management, Iteration Planning, Slack, Reducing the need for slack, Stories, Estimating, Velocity and the Iteration Timebox.

**UNIT V**

Developing: Incremental Requirements, Customer Tests, Test- Driven Development, How to use TDD, Refactoring, Simple Design, Incremental Design and Architecture, Spike Solutions, Performance Optimization.

**TEXTBOOKS:**

1. James Shore and Shane Warden, "The Art of Agile Development", O'REILLY, 2007.
2. Robert C. Martin, "Agile Software Development, Principles, Patterns, and Practices", PHI, 2002

**REFERENCES:**

1. Craig Larman, —Agile and Iterative Development: A Managers Guide, Addison-Wesley, 2004.
2. Kevin C. Desouza, —Agile Information Systems: Conceptualization, Construction, and Management, Butterworth-Heinemann, 2007.
3. Andrew Stellman and Jennifer Greene -Learning Agile, Revision History for the First Edition,2013, Published by O'Reilly Media, Inc.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**INFORMATION STORAGE AND MANAGEMENT**

**(PROFESSIONAL ELECTIVE –IV)**

**Course Code: GR22A4052** **L/T/P/C: 3/0/0/3**

**IV Year I Semester**

**Course Outcomes:**

1. Summarize the components of storage infrastructure.
2. Analyze the storage architectures including storage subsystems.
3. Develop the methods for business continuity, backup and recovery.
4. Integrate the concepts of storage security and information security applied to virtual machine.
5. Apply the storage infrastructure for cloud computing and its techniques.

**UNIT I**

**INTRODUCTION TO INFORMATION STORAGE MANAGEMENT**

**Virtualization and Cloud Computing:** Fiber Channel: Overview, Business Continuity,Back Up Recovery: Business Continuity: Information Availability, Storage Security and Management: Cloud Computing: Cloud Enabling Technologies

**Evolution of Storage Architecture:** SAN and its Evolution BC Terminology, BC Planning life cycle, Information Security Framework, Characteristics of Cloud Computing

**UNIT II**

**DATA CENTRE INFRASTRUCTURE**

Components of FC SAN, FC Connectivity, FC Architecture, Failure Analysis, Business Impact Analysis, Risk Triad, Benefits of Cloud Computing.

**Virtualization and Cloud Computing:** IPSAN-iSCSI components, BC TechnologySolutions, Storage Security Domains, Cloud Service Models, Key challenges in managing information: iSCSI Protocol Stack iSCSI Names, Backup and Archive: Backup Purpose, Security Implementations in Storage Networking, Cloud Deployment models

**UNIT III**

**DATA CENTER ENVIRONMENT AND NAS**

**Data Center Environment:** Application, NAS: General Purpose Servers versus NAS Devices, Backup Considerations, Securing Storage Infrastructure in Virtualized and Cloud Environments, Cloud Infrastructure Mechanism: Logical Network Perimeter

**Network Attached Storage (NAS):** Benefits of NAS- File Systems and Network File Sharing Backup Granularity, Recovery considerations, RSA and VMware Security Products, Virtual Server, Cloud Storage Device

**UNIT IV**

**HOST AND INTELLIGENT STORAGE SYSTEM**

**Host:** Connectivity, Storage Components of NAS Backup Methods, Backup Architecture, Monitoring the Storage Infrastructure, Cloud Usage Monitor, Disk Drive Components, Disk Drive Performance, NAS I/O Operation, Backup and Restore Operations, Monitoring

Parameters, Resource Replication

**Intelligent Storage System:** NAS Implementations, Backup Topologies, Components Monitored, Monitoring examples, Ready Made environment, Components of an Intelligent Storage System, NAS File Sharing Protocols Backup in NAS Environments Storage Infrastructure Management Activities Container

**UNIT V**

**STORAGE PROVISIONING AND VIRTUAL STORAGE MACHINE**

**Storage Provisioning:** Object Based Storage Devices, Backup Targets, Data Deduplication for Backup Storage Infrastructure Management Challenges, Storage Management Examples Cloud Challenges, Types of Intelligent Storage Systems, Content Addressed Storage, Backup in Virtualized Environments, Storage Allocation to a New Server/Host, Cloud Adoption Considerations

**Virtual Storage Machine:** Creation of Virtual storage machine, Configuration and Tracing of FC scan, Sharing Files between host and Virtual, Creation of a Linux Instance in Public, Usage of Cloud services with open source, Navigation of storage system, iSCSI scan Machines, Usage of Backup techniques, Cloud, Generate a private key, Access using SSH client, cloud tools (like Eucalyptus, Open stack, Open Nebula and others)

**Text Books**

1. EMC Education Services, “Information Storage and Management”, 2nd edition Wiley India, ISBN-13:978-1118094839
2. Thomas Erl, “Cloud Computing: Concepts, Technology & Architecture”, PrenticeHall, 2013,ISBN:9780133387568

**References**

1. Ulf Troppens, Rainer, Wolfgang, Muller,”Storage Networks Explained”, India,Wiley, 2010, ISBN-13: 978-0470741436
2. Matthew Portnoy, “Virtualization Essentials”, ISBN-13: 978-1119267720, Sybex;2 edition

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**MULTIMEDIA APPLICATIONS**
**(PROFESSIONAL ELECTIVE –IV)**

**Course Code: GR22A4053** **L/T/P/C: 3/0/0/3**
**IV Year I Semester**

**Course Outcomes:**
1. Summarize the file formats like text, audio, video and image models in Multimedia.
2. Implement Action Script features in Multimedia applications.
3. Articulate data compression techniques in audio and video.
4. Analyze the audio and video Compression Techniques.
5. Apply the networking protocols for multimedia applications.

**UNIT I**
**Fundamental concepts in Text and Image:** Multimedia and hypermedia, World Wide Web, overview of multimedia software tools, Graphics and image data representation, graphics/image data types, file formats, **Color in image and video:** color science, color models in images, color models in video.
**Fundamental concepts in video and digital audio:** Types of video signals, analog video, digital video, digitization of sound, MIDI, quantization and transmission of audio.

**UNIT II**
**Action Script I:** Action Script Features, Object-Oriented Action Script, Data types and Type Checking, Classes, Authoring an Action Script Class.
**Action Script II:** Inheritance, Authoring an Action Script 2.0 Subclass, Interfaces, Packages, Exceptions.

**UNIT III**
**Application Development:** An OOP Application Frame work, Using Components withAction Script Movie Clip Subclasses.
**Multimedia Data Compression:** Lossless compression algorithm: Run-Length Coding, Variable Length Coding, Dictionary Based Coding, Arithmetic Coding, Lossless Image Compression, Lossy compression algorithm: Quantization, Transform Coding, Wavelet-Based Coding, Embedded Zero tree of Wavelet Coefficients Set Partitioning in Hierarchical Trees (SPIHT).

**UNIT IV**
**Basic Video Compression Techniques:** Introduction to video compression, video compression based on motion compensation, search for motion vectors, MPEG, Basic Audio Compression Techniques.

**UNIT V**
**Multimedia Networks:** Basics of Multimedia Networks, Multimedia Network Communications and Applications: Quality of Multimedia Data Transmission, Multimedia

over IP, Multimedia over ATM Networks, Transport of MPEG-4, Media-on-Demand - (MOD).

**Text Books:**

1. Fundamentals of Multimedia By ZeNian Li and mark S Drew PHI/Pearson Education
2. Essentials Action Script 2.0, Colin Moock, SPDO, REILLY

**References:**

1. Digital Multimedia, Nigel Chapman and Jenny Chapman,Wiley Dreantech
2. Macromedia Flash MX Professional 2004 Unleashed, Pearson.
3. Multimedia and Communications Technology, Steve Heath, Elevier (Focal Press)
4. Multimedia Applications, Steinmetz, Nahrstedt, Springer

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DISTRIBUTED DATABASE AND SYSTEMS**
**(OPEN ELECTIVE- IV)**

**Course code: GR22A4131** **L/T/P/C: 3/0/0/3**
**IV Year I Semester**

**Prerequisites:**

1 Knowledge in Data Base Management Systems
2 Knowledge in Computer Networks

**Course Outcomes:**

1. Demonstrate system architecture based on distributed databases.
2. Illustrate the introductory distributed system concepts and its structures.
3. Develop the query processing techniques in DDBMS.
4. Understand transaction management and concurrency control of distributed systems
5. Discover the parallel database systems and its architecture.

**UNIT I**

**Introduction:** Distributed data processing, what is a Distributed Database System, Advantages and Disadvantages of DDBS, Design Issues, Overview of Database and Computer Network Concepts.

**Distributed DBMS Architecture:** Transparencies in a distributed DBMS, Distributed DBMS architecture**.**

**UNIT II**

**Distributed Database Design:** Alternative design strategies, Distributed design issues, Fragmentation, Allocation.

**Semantic Data Control:** View management, Data security, Semantic Integrity Control.

**UNIT III**

**Overview of Query Processing**: Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing, Query decomposition, Localization of distributed data.

**Optimization of Distributed Queries:** Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms.

**UNIT IV**

**Introduction to Transaction Management**: Definition of Transaction, Properties of transaction, Types of transaction.

**Distributed Concurrency Control:** Serializability theory, Taxonomy of concurrency control mechanisms, locking-based concurrency control algorithms, Timestamp-based concurrency control algorithms, Optimistic Concurrency Control Algorithms, Deadlock Management.

**UNIT V**

**Reliability:** Reliability concepts and measures, Failures in Distributed DBMS, Local Reliability protocols, Distributed Reliability protocols, dealing with site failures, Network Partitioning, Parallel Database Systems, Database Servers, Parallel Architectures.

**TEXT BOOKS:**

1. Principles of Distributed Database Systems, Second Edition, M. Tamer Ozsu Patrick Valduriez.
2. Distributed Databases principles and systems, Stefano Ceri, Giuseppe Pelagatti, TataMcGrawHill.

**REFERENCES:**

1. Fundamental of Database Systems, Elmasri&Navathe, Pearson Education,Asia.
2. Database System Concepts, Korth&Sudarshan, TMH

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SOFTWARE TESTING METHODOLOGIES**
**(PROFESSIONAL ELECTIVE- IV)**

**Course Code: GR22A4058** **L/T/P/C: 3/0/0/3**
**IV Year I Semester**

**Prerequisites:**

1. Students should have finish a course on Software Engineering.
2. Basic Knowledge about Software Testing.

**Course Outcomes:**

1. Identify the various bugs and correcting them after knowing the consequences of the bug.
2. Apply Path testing Strategies to conduct as part of White Box Testing.
3. Apply various Data flow testing techniques for exploring Data Bugs and Domain Bugs.
4. Design test cases based on decision tables for a given logical construct.
5. Understand graph matrices and apply matrices techniques for the simplification of graphs and simplify testing process.

**UNIT - I**

**Introduction:** Purpose of testing, Dichotomies, Model for testing, Consequences of bugs, Taxonomy of Bugs.

**UNIT - II**

**Flow Graphs and Path Testing:** Basics concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.
**Transaction Flow Testing:** Transaction flows, transaction flow testing techniques.

**UNIT - III**

**Dataflow testing**: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.
**Domain Testing**: Domains and paths, Nice & ugly domains, Domain Testing, domains and interfaces testing, domain and interface testing, domains and testability.

**UNIT - IV**

**Paths, Path products and Regular expressions:** Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection.
**Logic Based Testing:** Overview, decision tables, path expressions, kv charts, specifications.

**UNIT - V**

**State, State Graphs and Transition testing:** State graphs, good & bad state graphs, state testing, Testability tips.
**Graph Matrices and Application:** Motivational overview, matrix of graph, relations, power of a matrix, Node Reduction algorithm.

**TEXT BOOKS:**

1. Software Testing techniques – Boris Beizer, Dreamtech, 2nd Edition.
2. Software Testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.

**REFERENCE BOOKS:**

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques –SPD(Oreille).
3. Software Testing in the Real World – Edward Kit, Pearson.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**INTRODUCTION TO DATA MINING**
**(OPEN ELECTIVE- III)**

**Course Code: GR22A4080** **L/T/P/C:3/0/0/3**
**IV Year I Semester**

**Course Outcomes:**

1. Learn the concepts of database technology evolutionary path which has led to the needfor data mining and its applications.
2. Apply pre-processing statistical methods for any given raw data.
3. Apply Apriori and FP growth algorithms for forming strong association rules.
4. Extract knowledge and implementation of data mining techniques
5. Apply the data mining algorithm for solving practical problems.

**UNIT I**

**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

**UNIT II**

**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

**Introduction to Data Warehouse:** Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Marts.

**UNIT III**

**Mining Frequent Patterns, Associations:** Basic Concepts, Market BasketAnalysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules.

**UNIT IV**

Classification: Issues Regarding Classification, Classificationby Decision Tree Induction, Bayesian Classification, Rule-Based Classification.

**Prediction:** Issues Regarding Prediction, Regression techniques.

**Accuracy and Error measures:** Evaluating the accuracy of a Classifier or a Predictor.

**UNIT V**

**Cluster Analysis Introduction: Types** of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods - k-Means and k-Medoids, Hierarchical Methods – Agglomerative, BIRCH.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Textbooks:**

1. Data Mining– Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

**References:**

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, PearsonEdn Asia.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
# CRYPTOGRAPHY AND NETWORK SECURITY LAB

**Course Code: GR22A4055** **L/T/P/C: 0/0/4/2**
**IV Year I Semester**

**Course Outcomes:**

1. Interpret the ciphers used for encryption and decryption.
2. Implement the symmetric encryption algorithms.
3. Analyze the asymmetric encryption algorithms.
4. Summarize the hash algorithms and classes related to digital certificates.
5. Illustrate the intrusion detection and web security systems.

**TASK 1**:
Write a Java program to perform encryption and decryption using the following algorithms.
a. Ceaser cipher b. Substitution cipher c. Hill Cipher

**TASK 2:**
Implement symmetric block cipher encryption and decryption using DES algorithm in C/JAVA.

**TASK 3:**
Write a C/JAVA program to implement encryption technique using Blowfish algorithm.

**TASK 4:**
Implement the encryption of block chunk of 128 bits size using AES algorithm in C/JAVA.

**TASK 5:**
Write a C/JAVA program on Rivest Cipher 4(RC4) logic.

**TASK 6**:
Implement DES-2 and DES-3 using Java cryptography package.

**TASK 7**:
Design a Java program to implement RSA algorithm.

**TASK 8**:
Implement key exchange protocol using the Diffie-Hellman algorithm.

**TASK 9**:
Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

**TASK 10:**
Calculate the message digest of a text using the MD5 algorithm in JAVA.

**TASK 11**:
Explore the Java classes related to digital certificates.

**TASK 12**:
Implement a program in java, which performs Cross-site scripting(XSS) Attacks.

**Text Books:**

1. Network Security Essentials (Applications and Standards) William Stallings Pearson Education.
2. Fundamentals of Network security by Eric Maiwald (Dreamtech press)
3. XSS Attacks: Cross Site Scripting Exploits and Defense by Seth Fogie (Author), JeremiahGrossman (Author), Robert Hansen (Author), Anton Rager (Author), Petko D. Petkov (Author)

**References:**

1. Introduction to Cryptography, Buchmann, Springer.
2. Cryptography and network security, Third Edition,

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## DEEP LEARNING LAB

**Course Code: GR22A4081** **L/T/P/C: 0/0/4/2**
**IV Year I Semester**

**Course Outcomes:**
1 Upon the Successful Completion of the Course, the Students would be able to:
2 Learn the Fundamental Principles of Deep Learning.
3 Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
4 Implement Deep Learning Algorithms and Solve Real-world problems.
5 Apply Generative Algorithms

**LIST OF EXPERIMENTS:**
**TASK-1**: Setting up the Spyder IDE Environment and Executing a Python Program
**TASK-2:** Installing Keras, Tensorflow and Pytorch libraries and making use of them
**TASK-3:** Implement Activation Functions in Neural Networks and analyse their usage.
**TASK-4:** Implement Perceptron training algorithm to classify flowers in IRIS dataset
**TASK-5:** Build a three-layer Artificial Neural Network by implementing the Back propagation algorithm.
**TASK-6**: Applying the Convolution Neural Network on computer vision problems
**TASK-7**: Image classification on MNIST dataset (CNN model with Fully connected layer)
**TASK-8**: Applying the Deep Learning Models in the field of Natural Language Processing
**TASK-9**: Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
**TASK-10**: Applying the Autoencoder algorithms for encoding the real-world data
**TASK-11**: Applying Generative Adversial Networks for image generation and unsupervised tasks.
**TASK-12**: Design a Deep Learning framework for Object Detection. GANS

**TEXT BOOKS:**
1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

**REFERENCES:**
1. Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan, C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education,2004.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**PROJECT WORK - PHASE I**

**Course Code: GR22A4082** **L/T/P/C: 0/0/12/6**
**IV Year I Semester**

**Course Outcomes:**
At the end of this course, students will be able to:
1. Practice and acquire the knowledge within the chosen area of technology for Project Development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop Engineering Projects by implementing technical aspects.
4. Work as an individual or in a team in development of Technical Projects.
5. Compile and report effectively the project related activities and findings.

# IV YEAR
# II SEMESTER

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**FUNDAMENTALS OF MANAGEMENT AND ENTREPRENEURSHIP**

**Course Code: GR22A3116** **L/T/P/C: 3/0/0/3**
**IV Year II Semsester**

**Course Outcomes:**

1 The students understand the significance of management knowledge in their profession and approaches of management through its evaluation.
2 The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course.
3 The students can explore the functional areas of management such as human resources, production and marketing management practices in their domain areas and apply these concepts in the real- world scenario.
4 The student will be exposed to the basic concepts of entrepreneurship and its development process.
5 The student will be able to evaluate business ideas and attain hands on experience in designing value proposition and he will acquire the ability of developing a business plan / model.

**UNIT–I: Introduction to Management:** Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills; **Evolution of Management Thought**- Classical Approach- Scientific and Administrative Management; The Behavioural approach; The Systems Approach; Contingency Approach. Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles and leadership theories.

**UNIT– II: Planning and Organizing:** Planning – Planning Process, Types of Plans, Decision making and Steps in Decision Making; Principles of Organization: Span of control, organizational Design & Organizational Structures; Departmentalization, Delegation; Centralization, Decentralization. **controlling** – basic control process – control techniques.

**UNIT–III: Human Resources, Production and Marketing Management:** Concepts of HRM, HR planning, Recruitment, Selection, Training and Development, elements of wage and salary, Performance Appraisal , Principles and Types of Plant Layout-Methods of Production(Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement - Business Process Reengineering(BPR), Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

**UNIT–IV: Entrepreneurship:** Characteristics and skills of an entrepreneur, Entrepreneur scenario in India and abroad. Types of entrepreneurs, types of ownership, small business in Indian economy. Financial aspects: sources of rising capital, schemes of Department of Industries (DIC), KVIC, SIDBI, NABARD, NSIC, IFCI and IDBI. Risk Reduction strategies, Strategies for growth.

**UNIT–V: Creating and Starting the venture:** Creativity and the business idea; Developing the businessplan (Business model – Lean canvas by Alexander Osterwalder) and writing the

business Plan.

**Activity: Student need to submit their own business plan for the identified business area.**

**TEXTBOOKS:**

1 Fundamentals of management by Stephen P Robbins; Mary K Coulter; David A DiCenzo, Pearson 2017
2 Principles and Practice of Management, L. M. Prasad, Sultan Chand & Sons, 2012
3 Entrepreneurship- Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.2009

**REFERENCES:**

1. Essentials Of Management - An International Perspective: Harold Koontz , Heinz Weinrich Tata McGraw Hill,2019
2. Essentials of Management, Koontz Kleihrich, Tata Mc – Graw Hill.
3. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
4. Entrepreneurship- Rajeev Roy, Oxford, 2011
5. Intellectual Property- Deborah E.Bouchoux, Cengage, 2012

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**REAL TIME OPERATING SYSTEMS**
**(PROFESSIONAL ELECTIVE –V)**

**Course Code: GR22A4120** **L/T/P/C:3/0/0/3**
**IV Year II Semester**

**Course Outcomes:**

1 Summarize the concepts of Operating system Principles, System Calls and Files.
2 Analyze the network topology and network communication process used in distributed operating systems.
3 Implement the Real-time operating system languages and models.
4 Paraphrase the RTOS Kernel Principles and design patterns for inter task synchronization and communication.
5 Articulate the emerging trends and applications in Real-time systems.

**UNIT I**

Review of Operating Systems: Basic Principles, system calls, Files-Processes, design and implementation of processes, Communication between processes, operating system structures.

**UNIT II**

Distributed Operating Systems: Topology, Network Types, Communication, RPC, Client servermodel,Distributed file systems and design strategies.

**UNIT III**

Real Time Models and Languages: Event based, Process based, Graph models, Petrinet models, Real- time Languages, RTOS tasks, RTscheduling, Interrupt processing, Synchronization, Controlblocks, Memory requirements.

**UNIT IV**

Implementation of RTOS in ESP32, Inter-Task Communication in the Spark Fun ESP32 thing with Free RTOS.

**Real-Time System Design Patterns:** Patterns for task synchronization and communication, Patterns for fault tolerance and error handling in real-time systems, Patterns for handling resource conflicts and priority inversion, Patterns for adapting to changing system conditions

**UNIT V**

**Emerging Trends in Real-Time Systems:** Cyber-Physical Systems (CPS) and IoT integration, Edge and fog computing, Machine learning and AI in real-time applications, Security and safety challenges in real-time systems, Industry trends and future directions in real-time system design, Implementation and analysis of real-time systems using an RTOS, Performance evaluation and optimization of real-time tasks,Design and simulation of real-time communication protocols, Modeling and analysis of a real-time systemusing formal methods.

**Text Books:**

1. Charles Crowley “operating systems , A design oriented approach” McGraw Hill
2. Tenenbum, “Distributed Operating Systems”PHI,1999

**References:**

1. CM Krishna,Kang G. Shin, “Real time Systems”, McGrawHill,1997
2. Raymond J.A., Donald L Baily, “An introduction to real time operating systems” PHI, 1999.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**CYBER FORENSICS**
**(PROFESSIONAL ELECTIVE –V)**

**Course code: GR22A4130** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Prerequisites:**

1. Student should be aware of Information Security concepts
2. Student required Computer programming and Information science

**Course Outcomes:**

1. Discuss the security issues network layer and transport layer.
2. Apply security principles in the application layer.
3. Explain computer forensics.
4. Use forensics tools.
5. Analyze and validate forensics data.

**UNIT I**

**Network Layer Security & Transport Layer Security** IPSec Protocol - IP Authentication Header - IP ESP - Key Management Protocol for IPSec. Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.

**UNIT II**

**E-Mail Security & Firewalls** PGP - S/MIME - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs- SET for E-Commerce Transactions

.

**UNIT III**

**Introduction to Computer Forensics** Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

**UNIT IV**

Evidence **Collection and Forensics Tools** Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/Hardware Tools.

**UNIT V**

**Analysis and Validation** Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile

Devices Forensics.

**TEXT BOOKS:**

1. Cybersecurity & Digital Forensics by ANAS ZAKIR – 17 March 2022
2. Cyber Security and Digital Forensics by Mangesh M. Ghonge, Sabyasachi Pramanik, Ramchandra Mangrulkar, Dac-Nhuong Le Released March 2022 Publisher(s): Wiley-Scrivener
3. Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
4. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.

**REFERENCE BOOKS:**

1. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.
2. Richard E.Smith, "Internet Cryptography", 3rd Edition Pearson Education, 2008.
3. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.
4. "Cyber Forensics A Complete Guide – 2020" Edition Kindle Edition by Gerardus Blokdyk .
5. Cyber Forensics Examining Emerging and Hybrid Technologies Edited by Albert J. Marcella Majid Yar, "Cybercrime and Society", SAGE Publications Ltd, Hardcover, 2nd Edition,

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INTRODUCTION TO ROBOTICS**
**(PROFESSIONAL ELECTIVE –V)**

**Course Code: GR22A4143** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Course Outcomes:**
1. Outline basic concept of robotics.
2. Analyze Instrumentation systems and their applications to various
3. Discuss about the differential motion add statics in robotics
4. Illustrate various path planning techniques.
5. Develop dynamics and control in robotics industries.

**UNIT I**

**CONCEPTS**

Brief history-Types of Robot–Technology-Robot classifications and specifications-Design and controlissues- Various manipulators – Sensors - work cell - Programming languages.

**UNIT II**

**DIRECT AND INVERSE KINEMATICS**

Mathematical representation of Robots - Position and orientation – Homogeneous transformation- Various joints- Representation using the Denavit Hattenberg parameters - Degrees of freedom-Direct kinematics-Inverse kinematics- SCARA robots- Solvability – Solution methods-Closed form solution.

**UNIT III**

**MANIPULATOR DIFFERENTIAL MOTION AND STATICS**

Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse - Wrist and arm singularity - Static analysis - Force and moment Balance.

**UNIT IV**
**PATH PLANNING**

Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

**UNIT V**
**DYNAMICS AND CONTROL**

Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.

**TEXT BOOKS**:

1. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2005.
2. JohnJ.Craig , Introduction to Robotics Mechanics and Control, Third edition, Pearson Education 2009.
3. M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, Industrial Robotics, McGraw- Hill Singapore, 1996.

**REFERENCES:**

1 Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis', Oxford University Press, Sixth impression, 2010.
2 K. K.Appu Kuttan, Robotics, I K International, 2007.
3 Edwin Wise, Applied Robotics, Cengage Learning, 2003.
4 R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, Prentice Hall of India, New Delhi, 1994.
5 B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration,Allied Publish

**GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DESIGN PATTERNS**
**(PROFESSIONAL ELECTIVE –V)**

**Course Code: GR22A4063** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Prerequisites:**

Knowledge on oops and UML concepts.

**Course Outcomes:**

1 Ability to analyze and apply different design patterns for real life scenarios.
2 Ability to solve Object oriented design problems with a case study of designing a Document Editor.
3 Illustrates the skill apply creational design patterns.
4 Demonstrates the ability to apply different structural design patterns.
5 Analyze and Apply different behavioral design patterns.

**UNIT I**

**Introduction:** What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

**UNIT II**

**A Case Study:** Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

**UNIT III**

**Creational Patterns:** Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussionof Creational Patterns.
**Structural Pattern Part-I:** Adapter, Bridge, Composite.

**UNIT IV**

**Structural Pattern Part-II:** Decorator, Façade, Flyweight, Proxy.
**Behavioral Patterns Part-I:** Chain of Responsibility, Command, Interpreter, Iterator.

**UNIT V**

**Behavioral Patterns Part-II:** Mediator, Memento, Observer, State, Strategy, Template Method Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History,The Pattern Community An Invitation, A Parting Thought.

**TEXTBOOKS:**

1. Design Patterns by Erich Gamma, Pearson Education.

**REFERENCES:**

1. Pattern's in JAVA Vol-I by Mark Grand,Wiley DreamTech.
2. Pattern's in JAVA Vol-II by Mark Grand,Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand,Wiley DreamTech.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SOFT COMPUTING**
**(PROFESSIONAL ELECTIVE – VI)**

**Course Code: GR22A3037** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Prerequisites:**

A strong mathematical background, Proficiency with algorithms.

**Course Outcomes:**

1 Distinguish various soft computing techniques to solve real world problems.
2 Differentiate between Fuzzy Model with respect to Probabilistic Model.
3 Apply fuzzy inference techniques to solve problems in different domain.
4 Identify the problems, where Supervised and (Neural Networks) Unsupervised Learning
5 Techniques can be applied.
6 Evaluate the fitness function in Genetic Algorithm.

**UNIT-1**

**Introduction to Soft Computing:** Computing System, "Soft" Computing Versus "Hard" Computing, Soft Computing Methods, Recent trends in Soft Computing, Characteristics of Soft Computing, Applications of Soft Computing Techniques.

**UNIT-II**

**Fuzzy Logic: I(Introduction):** Fuzzy Logic Basic Concepts, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversation.

**UNIT-III**

**Fuzzy Logic: II (Fuzzy Membership, Rules):** Membership Functions, Interference in Fuzzy Logic, Fuzzy if then else Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzifications, Fuzzy Controller, Industrial Applications.

**UNIT IV**

**Neural Network:** Structure and Function of a single neuron: Biological Neuron, Artificial Neuron, Definition of ANN, Taxonomy of Neural Network, Difference between ANN and human brain, Characteristics and Applications of ANN, Single Layer Network.

**UNIT-V**

**Genetic Algorithms**: Basic Operators and Terminology, Traditional Algorithms Versus Genetic Algorithm, Simple Genetic Algorithm, General Genetic Algorithm, Classification of genetic Algorithm, Genetic Programming, Applications of Genetic Algorithm. Applications of Soft Computing: Internet Search Techniques, Hybrid Fuzzy Controllers.

**Text Books:**

1. B.K. Tripathy, J. Anuradha," Soft Computing Advances and Applications", Cengage Learning.
2. S.Rajsekaran and G.A. VijaylakshmiPai , "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.
3. Introduction to Artificial Neural Systems- Jacek M. Zurada, Web Publishing Company.

**Reference Books:**

1. Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall.
2. David E. Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", Addison Wesley.
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India
4. S. N. Sivanandam , S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer.
5. N. P. Padhy, "Artificial Intelligence and Intelligent Systems" Oxford University Press.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**COMPUTER GRAPHICS**

**Course code: GR22A3054** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Prerequisites:**

Student should have knowledge of the following mathematical concepts:
Matrices
1. Basic linear algebra such as solving a system of linear equations
2. Polynomials
3. Elementary signal processing (Fourier transform and filtering)

**Course Outcomes:**
1. Summarise the basic concepts used in computer graphics.
2. Implement various algorithms to draw line, circle, scan and convert the basic geometrical primitives.
3. Apply different algorithms for drawing 2D primitives such as transformations, area filling and clipping.
4. Analyse the importance of 3D modelling and projections.
5. Demonstrate the fundamentals of animation, virtual reality and its related technologies.

**UNIT I**
**Introduction to computer graphics-** Introduction, Non interactive/interactive Graphics, Uses of computer graphics, classification of Applications, Programming Language, Graphics system configuration.

**Graphic Systems-** Introduction, Cathode Ray Tube(CRT)basics, Refresh Display, Raster Display, Computer Graphic Software, Integration of Graphics Standard.

**UNIT II**
**Output Primitives-** Introduction, Representing Image, Straight Line, Line drawing algorithms, DDA Algorithm, Bresenham's Line Algorithm, Circle generating Algorithm, Bresenham's circle Algorithm, Midpoint circle Algorithm, Polygon filling Algorithms, Character or Text Generation, Aliasing and Antialiasing.

**UNIT III**
**Two Dimensional Transformations-Introduction, Representation of points, Matrix Algebra and Transformation**, Transformation of points, Transformation of straight line, Midpoint Transformation, Transformation of Parallel Lines, Transformation of Intersecting Lines, Rotation.

**Window Clipping-** Introduction, Viewing Transformation, Clipping, Point Clipping, Line Clipping, Cohen-Sutherland Line clipping, Polygon Clipping, Sutherland-Hodgman Algorithm, Curve Clipping.

**UNIT IV**

**3D Concepts and Techniques-** Introduction, 3D Transformations, Rotation about an axis Parallel to a Coordinate Axis, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, 3D Modeling Schemes, Projection, Orthographic Projection, Isometric Projection, Oblique Projection, perspective projection.

**UNIT V**

**Introduction to Multimedia-** Pc specification, visual elements, wav and mp3 format, sound elements, multimedia storage, flash animation.

**TEXTBOOKS:**

1. Computer Graphics, Amarendra N Sinha, Arun DUdai, TataMcGrawHill
2. Fundamentals of Multimedia, Ze-Nian Li, Mark S. Drew, Pearson Prentice Hall

**REFERENCE BOOKS**

1. Multimedia and communications technology, Steve Heath,Elsevier
2. Mathematical Elements for Computer Graphics,2nd Edition, David F. Rogers, J.AlanAdams

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INTRODUCTION TO DRONES**
**(PROFESSIONAL ELECTIVE –VI)**

**Course Code: GR22A4144** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Prerequisites:**
•Basic knowledge in Linux and Raspberry Pi

**Course Outcomes:**

1. Summarize the fundamental concepts of Lipo Battries & UAVs.
2. Demonstrate techniques for drone flight operations, shooting methods, camera set-up
3. Classify various components of drone and build to fly
4. Compile and combine various components
5. Build a Linux based drone using RaspberryPi.

**UNIT I**

Introduction to Drones: Overview, History of UAVs, Classifications of UAV- scale and lift generation methods, Advantages of Drones, Applications of Drones.
Hardware: Motors-overview, Motor Anotomy, LiPo Batteries and their use, Battery Connector Converters, Flight Controllers, Electronic Speed Controllers (ESCs), RC and Telemetry, Propellers,Frames, GPS and Optical Flow.

**UNIT II**

Designing a Drone Build: Thrust to Weight Ratios, Estimating Weight of Drones, Drive-train ofDrones: Props+Motors+Batteries, Estimating Thrust and Current Draw, Choosing ESCs.
How to build a Drone: Part Placement Planning, Soldering Bullet Connectors to ESCs, Soldering ESCs to PDB, Soldering Battery Connector to PDB, Attaching Legs to Frame, Installing Motors on Frame, Securing Raspberry Pi to Top Plate – Methods, Installing Top Plate to Drone Frame, Fixing ESCs to Drone Arms, Bind Receiver and Transmitter, Calibrate ESCs, Correct Motor Spin Direction, Fix PPM Encoder and RC Receiver to Frame, Wiring the ESC PWM Lines to Flight Controller, Install Telemetry Module to Drone, GPS Mount Assembly, Securing GPS to Frame, Velcro-ing Battery to Drone, Fixing Power Module to Frame, Securing Propellers to Motors.

**UNIT III**

Initial setup of Drone: Download and Flash OS Image to SD Card, Configure RPi to Connect to the Internet, SSH Into RPi, Configure ArduPilot on RPi, Install Mission Planner and Connect to Drone, Mission Planner Sensor Calibration and ArduPilot Setup, Setting Up the RC Controller, Charging LiPo Batteries, Leashing the Drone

**UNIT IV**

Flying the Drone: Flashing Light on Drone Flight Controller, Diagnosing Your Drone's Problems, Downloading Flight Logs and Requesting Help on ArduPilotForum, RC Sticks and what they Control, Flight Modes in ArduPilot, Setting Up FlightModes, First Time Flying Drills/Advice, Flying in ALT-HOLD Mode, Flying in LOITER Mode, Using the LANDode, Using the RTL Mode.

**UNIT V**

Using the Linux Feature of Drone: Downloading ArduPilot Source Code, Compile ArduPilot Source Code, Changing Firmware in NAVIO Image, Installing Drone Kit, Script for Autonomous Mission: Takeoff and Land, Script for Autonomous Mission: Velocity Commands.

**Teaching Methodologies:**

- Power Point Presentations
- Tutorial Sheets
- Assignments

**Text Books:**

1. A beginners guide, Quadcopters and Drones, Mark D Smith, 2015
2. Drones (The Ultimate Guide): Ben Rupert,
3. Build a Drone: A Step-by-Step Guide to Designing, Constructing, and Flying Your Very OwnDrone, by Barry Davies

**References:**

1. Theory, Design, and Applications of Unmanned Aerial Vehicles- by A. R. Jha Ph.D. (Author), 2016
2. Handbook of Unmanned Aerial Vehicles- Editors: Valavanis, K., Vachtsevanos, George J.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SOFTWARE PRODUCT DEVELOPMENT AND MANAGEMENT**
**(PROFESSIONAL ELECTIVE –VI)**

**Course Code: GR22A4125** **L/T/P/C: 3/0/0/3**
**IV Year II Semester**

**Course Outcomes**:
1. Interpret the foundation of Software Product Development Methodology and planning.
2. Create the product architecture, design, and define the testing approach.
3. Analyze the product qualification and release the software with prior testing and training.
4. Summarize the framework for management control as well as legal and management compliance for marketing and selling the software.
5. Illustrate the software product maintenance, service and support throughout the product life cycle.

**UNIT I**

**FOUNDATION AND PLANNING: INTRODUCTION AND FOUNDATION:** Three Vital Aspectsof Software Project Management - Introduction to Software Product Development Methodology -Software Process Models -Roles - Responsibilities.
**PRODUCT PLANNING:** Project Planning: Top-Down and Bottom-Up Planning - Types of Activity- Project Duration: Schedule Monitoring Tools - Gantt Chart, PERT Chart, Critical Path.

**UNIT II**

**PRODUCT DEVELOPMENT:** Initiation -Architecture and Design -Product Specifications - Defining the Final Product - Data Flow Diagram, Data DictionaryTesting Approach- Software Testing: Test Plan - Development Testing: Verification and Validation - General Testing Methods: White Box and Black Box Testing - Unit Testing – System Integration Testing - Validation Testing - System testing.

**UNIT III**

**PRODUCT RELEASE:** Software Quality - Quality Measures - FURPS - Software Quality Assurance- Software Reviews - Format Technical Review (FTR) Formal Approaches to SQA –Compliance withthe design and coding standards. Alpha Release/Product Qualification -Beta Release -Product TrainingPlanning.

**UNIT IV**

**Project Management and Control:** Framework for Management and control – Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change control

**PRODUCT SALES AND MARKETING:** Product Sales and Marketing Approach -Product Legal and Compliance Management -Product Market Rollout.

**UNIT V**

**MAINTENANCE SERVICES AND SUPPORT:** Software as an evolutionary entity, need for maintenance, categories of maintenance, Software Version Control, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change

Control Process, SoftwareVersion Control, Product Support -Product Governance -Monitoring and Control Through-Out Entire Product Lifecycle, Case study.

**TEXT BOOKS:**

1. Dan Conde, Software Product Management: Managing Software Developmentfrom Idea toProduct to Marketing to Sales, Aspatore Books; 1st edition
2. Alyssa Dver , Software Product Management Essentials, Meghan KifferPr

**REFERENCES:**

1. GerardusBlokdyk, Software Product Development A Complete Guide, 5starcooks
2. Allan M. Anderson, Product Development and Management Body of Knowledge: A Guidebook for Training and Certification, CreateSpace Independent Publishing Platform
3. https://en.wikipedia.org/wiki/Software_development

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**PROJECT WORK - PHASE II**

**Course Code: GR22A4145** **L/T/P/C: 0/0/12/6**
**IV Year II Semester**

**Course Outcomes:**
At the end of this course, students will be able to:
1. Practice and acquire the knowledge within the chosen area of technology for Project Development.
2. Identify, discuss, and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Design and develop Engineering Projects by implementing technical aspects.
4. Work as an individual or in a team in development of Technical Projects.
5. Compile and report effectively the project related activities and findings.

# OPEN ELECTIVES

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## SOFT SKILLS AND INTERPERSONAL SKILLS
### (OPEN ELECTIVE)

**Course Code: GR22A3145** **L/T/P/C:3/0/0/3**

**Course Outcomes:**
- Develop soft skills communication skills, leadership skills etc.
- Implement goal setting techniques to build a promising career and evaluate the power of confidence building and self-esteem with examples.
- Design formal report and proposals with appropriate formal expressions.
- Create healthy workplace environment by treating others with respect and dignity.
- Describe team dynamics and exchange ideas about the elements of positive teamwork.

**Unit 1: Soft Skills**
- Introduction to soft skills, Definition of Soft skills, Importance of soft skills
- Communication skills, Usage of English in Business/Corporate scenario
- Nonverbal communication - Proxemics
- Presentation skills

**Unit 2: Team Building & Leadership Qualities**
- Qualities of a good leader
- Problem solving and Decision Making
- Strategic management
- Crisis management

**Unit 3: Personality Development**
- Motivation
- Goal setting
- Self-esteem
- Team skills

**Unit 4: Developing Reports and Proposals**
- Understanding reports and proposals
- Planning reports and proposals
- Writing beginning, body and ending
- Formats of reports and proposals

**Unit 5: Interpersonal Skills**
- Understanding professional relationships
- Networking professionally
- Showing basic office courtesies
- Interview skills

**Text Books:**
1. Soft Skills-Key to success in workplace and life Meenakshi Raman, Raman Upadhyay, CENAGE

**Reference Books:**

1. Soft skills for Everyone - Jeff Butterfield, CENAGE Learning
2. Soft skills for Interpersonal Communication - S.Balasubramaniam (ORIENT BLACKSWAN)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR**
**OPEN ELECTIVE**

**Course Code:GR22A4049** **L/T/P/C: 3/0/0/3**

**Course Outcomes**

1. To acquaint the student with the determinants of intra -individual, inter-personnel and inter-group behaviour in organizational setting.
2. To Understand individual behavior in organizations, including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making, and motivational theories and apply in the organizational context.
3. To assess the group behavior in organizations, including communication, leadership, power and politics, conflict, and negotiations in the framework of organization and to familiarize the concepts, techniques and practices of human resource development in the current organizational view.
4. To impart and apprise the capable of applying the principles and techniques as professionals for developing human resources in an organization.
5. To report the current trends and applications in HRD and Balanced Scorecard to measures the performance and to develop, implement, and evaluate organizational human resource development strategies aimed at promoting organizational effectiveness in different organizational environments.

**Unit-I Introduction to OB :** Organizational Behaviour- Concept and Emergence of OB Concept; Nature and Theoretical frameworks; Models of Organizational Behaviour, Challenges and Opportunities for Organizational Behavior;

**Unit-II Individual Behaviour:** Individual Behaviour: Personality, Learning, Values and Attitudes, Perception, Stress at work. Management's assumptions about people- McGregor's Theory X and Theory Y. Motivation - Maslow's Need Hierarchy, Herzberg's Two Factors Theory, Vroom's Expectancy Theory.

**Unit-III Inter-personal and Group Behaviour:** Interpersonal communication and Feedback; Transactional Analysis (TA); Johari Window. Group Behaviour: Group Dynamics, Cohesiveness and Productivity; Management of Dysfunctional groups; Group Decision Making. Leadership- Concept and Styles.

**UnitI-V Introduction to Human Resource Development:** Concept; Relationship between human resource management and human resource development; HRD mechanisms, processes and outcomes; HRD matrix; Roles and competencies of HRD professionals; Challenges in HRD, steps in HRD Process.

**UnitV HRD Applications and Trends:** Coaching and mentoring; Career management and development; Competency mapping; Balanced Score Card. HRD in Organizations: Selected cases covering HRD practices in government Organizations, manufacturing and service industries and MNCs.

**Text Books:**

1. Robbins, Stephen P. and Timothy A. Judge, Organizational Behaviour, Prentice -Hall, New Delhi.
2. Werner J. M., DeSimone, R.L., Human resource development, South Western.

**Reference Books:**

1. Luthans, Fred, Organizational Behaviour, McGraw-Hill, New York.
2. Gregory, Moorhead and Ricky W. Griffin, Managing Organizational Behaviour, Thomson South Western Publication.
3. Pareek, Udai and V. Sisodia, "HRD in the New Millennium, Tata McGraw - Hill Publishing Co. Ltd., New Delhi, 1999.
4. Haldar, U. K., Human resource development, Oxford University Press India.
5. Rao, T.V., Future of HRD, Macmillan Publishers India.
6. Rao, T.V., HRD Score Card 2500: Based on HRD audit, Response Books, SAGE Publications.
7. Mankin, D., Human resource development, Oxford University Press India.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**CYBER LAW AND ETHICS**

**OPEN ELECTIVE**

**Course Code: GR22A4077** **L/T/P/C: 3/0/0/3**

**Course Outcomes**

1. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
2. Students locate and apply case law and common law to current legal dilemmas in the technology field.
3. Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
4. Students will be able understand cybercrime and ethical practices and the student will be able to know and learn web technologies and related issues.
5. The student will be in position to interface with various issues pertaining to Intellectual Property, copy rights, patents rights etc. and provide an overview of cybercrime and framework.

**Unit I - The Legal System: Sources of Law and The Court Structure:** Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court), Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

**Unit II - Introduction cyber law:** Computers and its Impact in Society, Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level. , NITI Aayog and some current aspects.

**Unit –III - Constitutional & Human Rights Issues in Cyber space** : Freedom of Speech and Expression in Cyberspace, Right to Access Cyberspace, Access to Internet, Right to Privacy, Right to Data Protection.

**Unit –IV Cyber Crimes & Legal Framework**: Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act

**Unit –V Intellectual Property Issues in Cyber Space:** Interface with Copyright Law, Interface with Patent Law, Trademarks & Domain Names Related issues.

**Text Books:**

1. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
2. Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012)
3. Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)
4. Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
5. Sudhir Naib, The Information Technology Act, 2005: A Handbook.
6. S. R. Bhansali, Information Technology Act, 2000
7. University Book House Pvt. Ltd. Jaipur (2003).

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**ECONOMIC POLICIES IN INDIA**
**OPEN ELECTIVE**

**Course Code:GR22A4147** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**
1. Familiarize with the nature of business environment and its components.
2. The students will be able to demonstrate and develop conceptual framework of business environment.
3. Understand the definition of ethics and the importance and role of ethical behaviour in the business world today.
4. Explain the effects of government policy on the economic environment.
5. Outline how an entity operates in a business environment.

**Unit 1: Business environment**-factors effecting Business Environment-need for industrial policies, Overview of Indian Economy, Trends towards market economy, problems of underdevelopment – meaning, Main problems, reasons, of underdevelopment.

**Unit :2 Factors and measure**, Meaning of Economic development, National income, Per capital income, Quality of life, Capital Formation – Savings, Investment.

**Unit 3: NITI Aayog and Planning in India**, Niti Aayog and its function, how is Niti Aayog different from planning commission, Meaning, Importance, Main reasons of adopting, planning in India, Objectives of planning, Economic development, moderation, stability, self-sufficiency, employment etc, foreign aid, Employment. Allocation of Resources,

**Unit 4: Private and Public Sector, Public Sector** – role and growth, Achievements of the public sector, Private Sector – Importance Problems, New foreign Trade Policy.

**Unit 5: Present Economic Policy**, Main feature, Globalization, Expansion of Private sector, more market orient approach. Public distribution system, Industrial policies before and after 1991, Industrial Licensing, Monetary and Fiscal Policy, elements of Indian current GDP and review of current budget.

**Text Books:**
1. Francis Cherunilam: Business Environment: Text and Cases. 18/e. Himalaya. 2009.
2. Misra and Puri: Indian Economy, Himalaya, 2009.

**Reference Books:**
1. Indian Economy- A. N. Agarwal
2. Indian Economy – Mishra &Puri
3. Indian Development and planning – M. L. Jhingan
4. Indian Economy – R. S. Rastogi Yozna and Kurukshetra Magazines

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DATA SCIENCE FOR ENGINEERS**
**OPEN ELECTIVE**

**Course Code: GR22A3049** **L/T/P/C:3/0/0/3**

**Course Outcomes:**
1. Illustrate a flow process for data science problems.
2. Demonstrate the mathematical foundations for data science.
3. Analyze the data science process and predictive modelling.
4. Develop R codes for data science solutions.
5. Correlate results to the solution approach followed.

**UNIT I**
Introduction to R, Variables and datatypes in R, Data frames, Recasting and joining of dataframes, Recasting and joining of dataframes, Arithmetic, Logical and Matrix operations in R, Advanced programming in R : Functions, Control structures, Data visualization in R Basic graphics.

**UNIT II**
**Linear Algebra and Statistics for Data Science**: Solving Linear Equations, Linear Algebra Distance, Hyperplanes and Halfspaces, Eigenvalues, Eigenvectors, Statistical Modelling, Random Variables and Probability Mass/Density Functions, Sample Statistics.

**UNIT III**
Introduction to Data Science, Solving Data Analysis Problems - A Guided Thought Process, Predictive Modelling, Linear Regression, Model Assessment, Diagnostics to Improve Linear Model Fit.

**UNIT IV**
Simple Linear Regression Model Building, Cross Validation, Multiple Linear Regression Modelling Building and Selection.

**UNIT V:**
Classification, K - Nearest Neighbors (KNN), K - Nearest Neighbors implementation in R, K - means Clustering, K - means implementation in R.

**Text Books:**
1. Data Science for Engineers, 1st Edition, Raghunathan Rengaswamy, Resmi Suresh, CRC Press, Taylor & Francis Group.
2. Introduction to Linear Algebra, Fifth Edition, Gilbert Strang, ISBN: 978-09802327-7-6.
3. Applied Statistics and Probability for Engineers, Douglas Montgomery, George C Runger, Fifth Edition, John Wiley & Sons, Inc.

**Reference Books:**
1. Hands On Introduction To Data Science Hardcover – 2 April 2020 by Chirag Shah (Author)
2. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**DATA ANALYTICS USING OPEN SOURCE TOOLS**
**OPEN ELECTIVE**

**Course Code: GR22A3120** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Interpret about graphics techniques in data analysis.
2. Implement data modeling techniques for a dataset.
3. Develop the simulation for mining and clustering the data.
4. Infer the data using business intelligence and predictive analytics
5. Implement the data analytics using Programming Environments

**UNIT I**

**Graphics:** A Single Variable – Dot and Jitter Plots, Histograms and Kernel Density Estimates, The Cumulative Distribution Function, Rank-Order Plots and Lift Charts, Summary Statistics and Box Plots, Practice using Numpy, Two Variables- Scatter Plots, Smoothing, Logarithmic Plots, Banking, Practice using Matplotlib, Time As A Variable- Time-Series Analysis, More Than Two Variables- False-color plots, Multiplots.

**UNIT II**

**Modeling Data:** Guesstimation and the back of the envelope- Principles, Perturbation Theory and Error Propagation, Models from scaling arguments- Models, Arguments from Scale, Mean-Field Approximations, Common Time-Evolution Scenarios, Arguments from probability models- The Binomial Distribution and Bernoulli Trials, The Gaussian Distribution and the Central Limit Theorem, Power-Law Distributions and Non-Normal Statistics, Bayesian Statistics.

**UNIT III**

**Mining Data:** Simulations- Monte Carlo Simulations, Resampling Methods, Discrete Euent Simulations with *SimPy*, Finding Clusters- Distance and Similarity Measures, Clustering Methods, Pre and Postprocessing, *Pycluster*, Seeing the Forest for the trees- PCA, Kohonen Maps, PCA with R.

**UNIT IV**

**Applications:** Reporting, Business intelligence and Dashboards- Corporate Metrics and Dashboards, Data Quality Issues, Financial calculations and modeling- The Time Value of Money ,Uncertainty in Planning and Opportunity Costs, Cost Concepts and Depreciation, Predictive analytics- algorithms for classification.

**UNIT V**

**Programming Environments and Data analytics**

**Programming Environments**: Software Tools, A Catalog of Scientific Software - Matlab, R, Python**Results from Calculus:** Common Functions, Calculus, Useful Tricks -Binomial theorem, Linear transformation.

**Working with data:** Sources for Data, Cleaning and Conditioning, Sampling, Data File

Formats, TheCare and Feeding of Your Data Zoo.

**Text Books:**

1. Philipp K. Janert, Data Analysis with Open Source Tools, O'Reilly Media, Inc, November 2010: First Edition.

**Reference Books:**

1. G James, D. Witten, T Hastie, and R. Tibshirani, An Introduction to Statistical Learning: with Applications in R, Springer, 2013
2. Chambers, John, Software for Data Analysis Programming with R, Springer, 2008
3. Trevor Hastie Robert Tibshirani Jerome Friedman, The Elements of Statistical Learning, Data Mining, Inference, and Prediction (2nd Edn.), Springer, 2014
4. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013
5. Upadhyaya and A. Upadhyaya, Material Science and Engineering, Anshan Publications, 2007

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**AUGMENTED REALITY AND VIRTUAL REALITY**
**OPEN ELECTIVE**

**Course Code: GR22A4054** **L/T/P/C:3/0/0/3**

**Course Outcomes:**
1. Analyze about augmented reality.
2. Identify AR devices for various applications.
3. Analyze about virtual reality.
4. Interpret about usage of VR devices and human factors involved.
5. Apply AR & VR technology in various domains.

**UNIT I**
Introduction to Augmented Reality, The Relationship Between Augmented Reality and Other Technologies, Augmented Reality Concepts, How Does Augmented Reality Work?, Ingredients of an Augmented Reality Experience.

**UNIT II**
Augmented Reality Hardware, Major Hardware Components for Augmented Reality Systems, Augmented Reality Software, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application.

**UNIT III**
Virtual Reality: The Three I's of Virtual Reality, A Short History of Early Virtual Reality, EarlyCommercial VR Technology , VR Becomes an Industry, The Five Classic Components of a VRSystem.
Input Devices: Trackers, Navigation, and Gesture Interfaces: Three-Dimensional Position Trackers, Navigation and Manipulation Interfaces

**UNIT IV**
Output Devices: Graphics, Three-Dimensional Sound, and Haptic Displays : Graphics Displays,Sound Displays, Haptic Feedback.
Human Factors in VR: Methodology and Terminology, User Performance Studies, VR Health and Safety Issues, VR and Society

**UNIT V:**
Augmented Reality Applications, What Makes a Good Augmented Reality Application? Application Areas: Education, Gaming, Robotics, Health care, Manufacturing, Evaluating Augmented Reality Applications.

**Text Books**:
1. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley IEEE Press,2003/2006.

**Reference Books:**
1. LaValle, "Virtual Reality", Cambridge University Press, 2016.
2. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality

Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.
3. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
4. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**BASICS OF JAVA PROGRAMMING**

**OPEN ELECTIVE**

**Course Code:GR22A3072** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Apply knowledge on key attributes of Object-Oriented Programming (OOP) and control structures
2. create and manipulate classes and objects, employ various methods and method utilization.
3. Demonstrate expertise in both array-based and string-based structures.
4. understanding of Java's inheritance and interface concepts
5. proficient at organizing Java code using packages and exception handling

**UNIT I:**

**Java Programming Fundamentals**: Java Language, Key Attributes of Object-Oriented Programming, Java Development Kit, Simple Program, Create Blocks of Code, Keywords, Identifiers, The Java Class Libraries.

**Data Types and Operators**: Java's Primitive Types, Literals, Variables, Scope and Lifetime of Variables, Operators- Arithmetic, Relational, Logical, Bitwise, Assignment. Type conversion in Assignments, Using a Cast, Operator Precedence.

**Program Control Structures**: if, switch, for, enhanced for, while, do-while, break, continue.

**UNIT II:**

**Introduction to Classes, Objects and Methods:** Class Fundamentals, Objects creation, Reference Variables and Assignment, Methods, returning a Value, Using Parameters, passing objects to methods, passing arguments, Method Overloading, Constructors, Parameterized Constructors, Overloading Constructors. new Operator, this Keyword, Command-Line Arguments.

**UNIT III:**

**Arrays:** Introduction to Arrays, 1D Arrays, Multidimensional Arrays, Irregular Arrays, Using the Length Member. Arrays class of util package.

**Strings:** String class, constructors, length(), string literals, concatenation, Character extraction, string comparison, searching strings, modifying, data conversion, changing the case, joining, split(). String Buffer class: constructors, length(), capacity(), ensure Capacity(), set Length(), charAt(), setCharAt(), getChars(), append(), insert(), reverse(), delete(), deleteCharAt(), replace().

**UNIT IV:**

**Inheritance:** Basics, Inheritance Types, Using Super, Multilevel Hierarchy, Super class References and Subclass Objects, Method Overriding, Abstract Classes, Using final.
**Interfaces:** Fundamentals, Creating and Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Extending Interfaces, Nested Interface.

**UNIT V:**

**Packages:** Package Fundamentals, Member Access, Importing Packages, Static import.
**Exception Handling:** Exception Hierarchy, Fundamentals, Handling errors, Multiple Catch, Throwing and Rethrowing an Exception, Throwable, using finally, using throws, Creating Exception Subclasses.

**Text Books:**

1. Herbert Schildt, Dale Skrien, Java Fundamentals A Comprehensive Introduction, 1/e, Tata McGraw Hill, 2017.
2. Herbert Schildt, The Java complete References, 9/e, Tata McGraw Hill,2014.

**Reference Books:**

1. Y. Daniel Liang , An Introduction to JAVA Programming, 10/e, Tata McGraw Hill.

2. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2012.

3. Balagurusamy, Programming with JAVA, 2/e, Tata McGraw Hill, 2014.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INTRODUCTION TO DBMS**
**OPEN ELECTIVE**

**Course Code: GR22A3141** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Identify the role of Database System Applications and the design issues related.
2. Design the logical model for the applications.
3. Construct a Database Schema, manipulate data using a SQL.
4. Apply the Schema Refinement techniques for a database design for optimized access.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.

**UNIT I**

**Introduction to Database And System Architecture:** Database Systems and their Applications, Database Vs File System, View of Data, Data Models, Database Languages-DDL and DML, Transaction Management, Database users and Administrators, Database System Structure.

**UNIT II**

**Introduction to Database Design:** ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship set, Extended ER Features, Conceptual Design with the ER Model, Logical database Design.

**Relational Model:** Introduction to Relational Model, Basic Structure, Database Schema, Keys, Relational Algebra

**UNIT III**

**SQL Queries and Constraints:** SQL Data Definition, Types of SQL Commands, Form of Basic SQL Query, SQL Operators, Set Operators, Nested Queries, Aggregate Operators, NULL values, Integrity Constraints Over Relations, Joins, Introduction to Views, Destroying / Altering Tables and Views, Cursors, Triggers.

**UNIT IV**

**Schema Refinement and Normal Forms:** Introduction to Schema Refinement, Functional Dependencies, Properties of Decomposition, Reasoning about FD, Normal Forms.

**UNIT V**

**Transaction Management:** Transaction Concept, Transaction State, Concurrent Executions, Serializability, Testing for Serializability.

**Concurrency Control:** Lock based Protocols, Timestamp based protocols,

**Recovery System:** Recovery and Atomicity, Log based recovery, Shadow Paging, Recovery with concurrent Transactions.

**Text Books:**

1. "Data base Management Systems", Raghurama Krishnan, Johannes Gehrke,TATA McGraw Hill 3rdEdition
2. "Data base System Concepts", Silberschatz, Korth, McGraw hill, V Edition.
3. "Introduction to Database Systems", C.J.Date Pearson Education.

**Reference Books:**

1. "Database Systems design, Implementation, and Management", Rob & Coronel 5th Edition.
2. "Database Management Systems", P. Radha Krishna HI-TECH Publications 2005.
3. "Database Management System", Elmasri Navate, Pearson Education.
4. "Database Management System", Mathew Leon, Leo

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INTRODUCTION TO DATA MINING**
**OPEN ELECTIVE**

**Course Code: GR22A4080** **L/T/P/C:3/0/0/3**

**Course Outcomes:**

1. Learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications.
2. Apply pre-processing statistical methods for any given raw data.
3. Apply Apriori and FP growth algorithms for forming strong association rules.
4. Extract knowledge and implementation of data mining techniques
5. Apply the data mining algorithm for solving practical problems.

**UNIT I**

**Introduction:** Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

**UNIT II**

**Data Preprocessing:** Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction.

**Introduction to Data Warehouse:** Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Marts.

**UNIT III**

**Mining Frequent Patterns, Associations:** Basic Concepts, Market Basket Analysis, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules.

**UNIT IV**

**Classification:** Issues Regarding Classification, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification.

**Prediction:** Issues Regarding Prediction, Regression techniques.

**Accuracy and Error measures:** Evaluating the accuracy of a Classifier or a Predictor.

**UNIT V**

**Cluster Analysis Introduction: Types** of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods - k-Means and k-Medoids, Hierarchical Methods – Agglomerative, BIRCH.

**Textbooks:**

1. Data Mining– Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

**Reference Books:**

1. Data Mining Techniques – Arun K. Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory and Dennis Murray, PearsonEdn Asia.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**PROGRAMMING IN PYTHON**
**OPEN ELECTIVE**

**Course Code: GR22A3077** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**
1. Demonstrate the concepts of control flow, data structures and Functions in Python
2. Design python programs using functional programming
3. Implement the file handling operations , exception handling mechanism
4. Design python programs using object oriented programming and multithreaded programming concepts
5. Develop GUI based applications using Tkinter

**UNIT I**
Basic features of Python-Interactive execution, comments, types, variables, operators, expressions, Statements-assignment, input, print, Control flow-Conditionals, Loops, break statement, continue statement, pass statement, Functions, definition, call, scope and lifetimeof variables, keyword arguments, default parameter values, variable length arguments, recursive functions.

**UNIT II**
Sequences-Strings ,Lists and Tuples-basic operations and functions, iterating over sequences, Sets and Dictionaries- operations and functions, Functional programming-mapping, filtering and reduction, Lambda functions, List comprehensions. Scope, namespaces and modules, import statement, creating own modules, avoiding namespace collisions when importing modules.

**UNIT III**
Files-operations-opening, reading, writing, closing, file positions. Exceptions – raising and handling exceptions, try/except statements, finally clause, standard exceptions, custom exceptions. , iterators and generators, Python program examples.

**UNIT IV**
Object oriented programming- classes, constructors, objects, class variables, class methods, static methods, operator overloading. Inheritance-is-a relationship, composition, polymorphism, overriding, multiple inheritance, abstract classes, multithreaded programming, Python program examples.

**UNIT V**
GUI Programming with Tkinter, Widgets (Buttons, Canvas, Frame, Label, Menu, Entry, Text, Scrollbar, Combobox, Listbox, Scale), event driven programming-events, callbacks, binding, layout management- geometry managers: pack and grid, creating GUI based applications in Python.

**Text Books:**
1. Exploring Python, Timothy A. Budd, McGraw Hill Publications.

2. Introduction to Programming using Python, Ys.Daniel Liang, Pearson.
3. Python Programming, Sheetal Taneja and Naveen Kumar, Pearson.

**Reference Books:**

1. Introduction to Computer Science using Python, Charles Dierbach, Wiley India Edition.
2. Fundamentals of Python, K. A. Lambert, B.L. Juneja, Cengage Learning.
3. Think Python, how to think like a computer scientist, Allen B. Downey, SPD, O'Reilly.
4. Core Python Programming, Wesley J. Chun, second edition, pearson.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INTERNET OF THINGS**
**OPEN ELECTIVE**

**Course Code: GR22A3147** **L/T/P/C: 3/0/0/3**

**Prerequisites**

Students are expected to have knowledge on Operating systems, Virtualization and Networking

**Course Outcomes:**

1. Learn characteristics, applications, components and challenges of Internet of Things (IOT)
2. Create understanding of IOT networking concepts – terminologies, stack components , infrastructure and data protocols
3. Create understanding of the concept of Cloud based IOT technologies, cloud service providers and security aspects
4. Develop skills in understanding and programming the Arduino and Raspberry Pi hardware platforms
5. Make the student understand the requirements, components, challenges and develop various application areas - smart homes, smart grids, smart health care, smart cities and industrial IOT

**UNIT I**

**Introduction to IOT:** Characteristics of IOT, Applications of IOT, IOT Categories, IOT Enablers and Connectivity Layers, Sensors, Actuators, IOT Components & Implementation, Challenges for IOT

**UNIT II**

**IOT Networking & Connectivity Technologies:** Connectivity terminologies-IOT Node, LAN,WAN, Gateway, IOT protocol Stack vs. Web Stack, IOT Identification and Data Protocols-IPV4,IPV6,HTTP,MQTT,COAP,AMQP,DDS Connectivity Technologies – Zigbee, Bluetooth, LoRa

**UNIT III**

**Cloud for IOT:** IOT with Cloud-Challenges, Cloud service providers for IOT-Overview, Cloud service model, Cloud Computing – Security aspects, Case Study, Fog computing, Edge computing

**UNIT IV**

**Hardware Platforms:** Programming with Arduino-Features of Arduino, Components of Arduino Board, Arduino IDE, Program Elements, Raspberry Pi – Introduction, Architecture, PIN Configuration, Implementation of IOT with Raspberry Pi

**UNIT V**

**IOT Applications** : Smart Homes-Smart Home Origin, Technologies, Implementation, Smart Grids-Characteristics, Benefits, Architecture, Components, Smart Cities-Characteristics, Frameworks, Challenges, Industrial IOT-Requirements, Design Considerations, Applications

**Text Books:**

1. Internet of Things, Jeeva Jose, Khanna Publishing, 2018

2. Internet of Things, Abhishek S Nagarajan, RMD Sundaram, Shriram K Vasudevan, Wiley, 2019
3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry,Pearson Education Limted, 2017

**Reference Books:**

1. The Internet of Things, Michael Miller, Pearson Education Limited, 2015
   IoT Applications, Security Threats, and Countermeasures, Padmalaya Nayak, Niranjan Ray, P. Ravichandran, Taylor &Francis,2021
2. Internet of Things: Architecture, Implementation and Security, MayurRamgir, Pearson Education Limited, 2019
3. IOT Fundamentals: Networking Technologies, Protocols and Use Cases for IOT, Rowan Trollope, David Hanes, Patrick Gassetete, Jerome Henry, Pearson Education Limited, 2017

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SCRIPTING LANGUAGES**
**OPEN ELECTIVE**

**Course code: GR22A4085** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**
1. Analyze a problem, identify and define the computing requirements appropriate to its solution.
2. Design Web pages with DB.
3. Implement the PHP Authentication Methodologies.
4. Implement PHP Encryption functions and Mcrypt Package
5. Understand the syntax and functions in Perl and Python.

**UNIT- I**
**PHP Basics**
PHP Basics- Features, Embedding PHP Code in your Web pages, outputting the data to the browser, Data types, Variables, Constants, expressions, string interpolation, control structures. Function, Creating a Function, Function Libraries, Arrays, strings and Regular Expressions.

**UNIT -II**
**MySQL Basics**
Introduction to MYSQL: Database Concepts, General Overview of MySQL database, Installation. Connecting and disconnecting from MySQl Server, Querying the database, Data Definition Language, Functions and Logical operators, Access privilege system.

**UNIT -III**
**Advanced PHP Programming**
Advanced PHP Programming: PHP and Web Forms, Files, PHP Authentication and Methodologies -Hard Coded, File Based, Database Based, IP Based, and Uploading Files with PHP, Sending Email using PHP, PHP Encryption Functions, the Mcrypt package.

**UNIT- IV**
**PERL:** Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes,strings, pattern and regular expressions, subroutines.
**Advanced PERL:** Finer points of looping, pack and unpack, file system, data structures, packages,modules, objects, interfacing to the operating system.

**UNIT -V**
**Python:** Introduction to Python language, Python-syntax, statements, functions, Built-in-functionsand Methods, Modules in Python, Exception Handling.

**Text Books:**
1. The World of Scripting Languages, David Barron,Wiley India. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore,Apress Publications (Dream tech.).
2. Python Web Programming, Steve Holden and David Beazley ,New Riders Publications.

**Reference Books:**

1. Open Source Web Development with LAMP using Linux ,Apache,MySQL,Perl and PHP, Lee and B.Ware(Addison Wesley) Pearson Education.
2. Programming Python,M.Lutz,SPD.
3. PHP 6 Fast and Easy Web Development ,Julie Meloni and Matt Telles, Cengage
4. Learning Publications.
5. PHP 5.1,I.Bayross and S.Shah,The X Team,SPD.
6. Core Python Programming,Chun,Pearson Education.
7. Guide to Programming with Python,M.Dawson,Cengage Learning.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SERVICES SCIENCE AND SERVICE OPERATIONAL MANAGEMENT**
**OPEN ELECTIVE**

**Course Code: GR22A4134** **L/T/P/C: 3/0/0/3**

**Pre-Requisite(s):** Fundamentals of Management, Operations Research

**Course Outcomes:**
1. Understand concepts of services and their significance in the economy and society and distinguish it from goods.
2. Understand the service strategy, design, and development.
3. Comprehend ways to design services and able to understand service guarantee, recovery, andfailures.
4. Forecast the service demand, supply and facilitate various methods to operate and manage services.
5. Understand the service productivity and how innovation can be approached from services point of view

**UNIT I**
**Introduction:** Service operations, Role of service in economy and society, Indian service sector
**Nature of Services and Service Encounters:** Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters
**Service-Dominant Logic:** From Goods-Dominant logic to Service-Dominant logic, Value Co- creation

**UNIT II**
**Service Strategy and Competitiveness:** Development of Strategic Service Vision (SSV), DataEnvelopment Analysis
**New Service Development**: NSD cycle, Service Blueprinting, Elements of service delivery system **Service Design:** Customer Journey and Service Design, Design Thinking methods to aid ServiceDesign
**Locating facilities and designing their layout:** models of facility locations (Huff's retail model),Role of service-scape in layout design
**Service Quality:** SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools

**UNIT III**
**Service Guarantee & Service Recovery:** Service guarantee and its types; Service failure – reasons for failure and service recovery strategies

**UNIT IV**
**Forecasting Demand for Services**: A review of different types of forecasting methods for demandforecasting.
**Managing Capacity and Demand**: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.
**Managing Facilitating Goods**: Review of inventory models, Role of inventory in services
**Managing service supply relationship:** Understanding the supply chain/hub of service, Strategiesfor managing suppliers of service

**Vehicle Routing Problem:** Managing after sales service, understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes

**UNIT V**

**Service Innovation:** Services Productivity, Need for Services Innovation

**Student Project:**

Option 1: Choose any service organization around and present it from the perspective of: nature of service, classification of service, blueprint or service design analysis, service quality, and any additional perspective you would like to add.

Option 2: Choose any latest research paper in services and explain your understanding and feedback on the same.

**Text Books:**

1. Fitzsimmons & Fitzsimmons, Service Management: Operations, Strategy, Information Technology, McGraw Hill publications (7th edition)

**Reference Books:**

1. Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D. (2012). *Services marketing:Integrating customer focus across the firm*. McGraw Hill.
2. Lovelock, C. (2011). *Services Marketing, 7/e*. Pearson Education India
3. Reason, Ben, and Lovlie, Lavrans, (2016) Service Design for Business: A Practical Guide toOptimizing the Customer Experience, Pan Macmillan India,
4. Chesbrough, H. (2010). Open services innovation: Rethinking your business to grow andcompete in a new era. John Wiley & Sons.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**IT PROJECT MANAGEMENT**

**OPEN ELECTIVE**

**Course Code: GR22A4135** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Learn the techniques to effectively plan manage, execute the projects.
2. Learn the techniques to control projects within time and cost targets with a focus on Information Technology and Service Sector.
3. Learn various agile methodologies.
4. Apply agile project management techniques such as Scrum on real time applications.
5. Develop real time applications using agile project management techniques such asDevOps.

**UNIT I**

**Project Overview and Feasibility Studies-** Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal

**Project Scheduling**: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity.

**UNIT II**

**Cost Control and Scheduling**: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling

**Project Management Features:** Risk Analysis, Project Control, Project Audit and Project Termination.

**UNIT III**

**Agile Project Management:** Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

**Other Agile Methodologies**: Introduction to XP, FDD, DSDM, Crystal

**UNIT IV**

**Scrum:** Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

**UNIT V**

**DevOps:** Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test-Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring.

**Text Books:**

1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum
2. Notes to be distributed by the course instructor on various topics

**Reference Books:**

1. Roman Pichler, Agile Product Management with Scrum
2. Ken Schwaber, Agile Project Management with Scrum (Microsoft Professional)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**MARKETING RESEARCH AND MARKETING MANAGEMENT**
**OPEN ELECTIVE**

**Course Code: GR22A4136** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. The students understand the significance of marketing management concepts, marketing environment, consumer behavior elements and strategies related to STP.
2. The student will be able to understand various product management strategies and the importanceof branding and packing.
3. Comprehend the dynamics of marketing mix elements such as pricing, distribution, and promotion mix elements to leverage marketing concepts for effective decision making.
4. Students will demonstrate analytical skills in identification and resolution of problems pertaining to marketing management and marketing research and uses of various statistical tools in marketing research.
5. Understanding the concepts of internet marketing and the fundamentals of business-to-business marketing strategy, CRM strategies.

**UNIT I**

**Marketing Concepts and Applications:** Introduction to Marketing & Core Concepts, Marketing ofServices, Importance of marketing in service sector.

**Marketing Planning & Environment:** Elements of Marketing Mix, Analyzing needs & trends inEnvironment - Macro, Economic, Political, Technical & Social

**Understanding the consumer:** Determinants of consumer behavior, Factors influencing consumerbehavior

**Market Segmentation:** Meaning & Concept, Basis of segmentation, selection of segments, MarketSegmentation strategies, Target Marketing, Product Positioning

**UNIT II**

**Product Management:** Product Life cycle concept, New Product development & strategy, Stages inNew Product development, Product decision and strategies, Branding & packaging

**UNIT III**

**Pricing, Promotion and Distribution Strategy:** Policies & Practices – Pricing Methods & Price determination Policies. Marketing Communication – The promotion mix, Advertising & Publicity, 5 M's of Advertising Management. Marketing Channels, Retailing, Marketing Communication, Advertising

**UNIT IV**

**Marketing Research**: Introduction, Type of Market Research, Scope, Objectives & Limitations Marketing Research Techniques, Survey Questionnaire design & drafting, Pricing Research, MediaResearch, Qualitative Research

**Data Analysis**: Use of various statistical tools – Descriptive & Inference Statistics, Statistical Hypothesis Testing, Multivariate Analysis - Discriminant Analysis, Cluster Analysis, Segmenting andPositioning, Factor Analysis

**UNIT V**

**Internet Marketing: Introduction to Internet Marketing**. Mapping fundamental concepts

ofMarketing (7Ps, STP); Strategy and Planning for Internet Marketing

**Business to Business Marketing:** Fundamental of business markets. Organizational buying process.Business buyer needs. Market and sales potential. Product in business markets. Price in business markets. Place in business markets. Promotion in business markets. Relationships, networks, and customer relationship management. Business to Business marketing strategy

**Home Assignments:**

Written Analyses of Cases – Students are expected to report on their analysis and recommendations of what to do in specific business situations by applying concepts and principles learned in class (Case Studies to be shared by Faculty) e.g., "Marketing Myopia"

1. Field visit & live project covering steps involved in formulating Market Research Project
2. Measuring Internet Marketing Effectiveness: Metrics and Website Analytics

**Text Books:**

1. Marketing Management (Analysis, Planning, Implementation & Control) – Philip Kotler
2. Fundamentals of Marketing – William J. Stanton & Others
3. Marketing Management – V.S. Ramaswamy and S. Namakumari
4. Marketing Research – Rajendra Nargundkar
5. Market Research – G.C. Beri
6. Market Research, Concepts, & Cases – Cooper Schindl

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INTRODUCTION TO DATA SCIENCE**
**OPEN ELECTIVE**

**Course Code: GR22A3056** **L/T/P/C: 3/0/0/3**

**Prerequisites:**

Knowledge of Python programming, Linear algebra, Statistics, Probability and Calculus

**Course Outcomes:**
1. Learn Numpy, Pandas for mathematical computation and Data Analysis
2. Analyze the importance of pre-processing techniques for Data Science
3. Learn and analyze various prediction and classification techniques on various datasets
4. Learn and analyze the applications of clustering techniques
5. Analyze Text data and Web scrapping data at morphological and syntactic and semantic levels using NLP techniques

**UNIT I**

Introduction to Data Science, Components of Data Science, Application of Data Science
**NumPy:** Array, Matrix and associated operations, Linear algebra and related operations
**Pandas: Series, Data Frames, Panels, R**eading files, Exploratory data analysis, Data preparation, Indexing, Slicing, Merging and Joining data. Working with MySQL databases
**Data Pre-processing Techniques**: Data Imputation, Data Encoding, Standardization and Normalization, Dimensionality reduction, Feature Selection methods

**UNIT II**

**Regression Analysis:** Introduction to Regression, Simple linear regression, Multi-linear regression, Evaluation metrics for regression
**Classification Methods**: Introduction to Classification, Naïve Bayes classifier, Decision Tree classifier, Support Vector Machines, Logistic Regression, Ensemble methods, Random Forest, Bagging, Boosting, Evaluation metrics for classification

**UNIT III**

**Clustering Methods**: Introduction to Clustering, Similarity distance measures, K-means algorithm, Hierarchical clustering algorithm, DB Scan algorithm, Evaluation metrics for clustering.

**UNIT IV**

**NLP Overview**, Tokenization, Stemming, stop words removal, POS tagging, Lemmatization, Feature extraction using SKlearn, Text Classification, Text Clustering.

**UNIT V**

**Learning Best Practices for Model Evaluation:**
Pipelining, Hyperparameter Tuning, Debugging algorithms with learning and validation curves.

**Text Books:**

1. Python Machine Learning, Second Edition by Sebastian Raschka Vahid Mir Jalili Statistics and Machine Learning in Python Edouard Duchesnay,

**Reference Books:**

1. Data Science From Scratch: First Principles with Python, Second Edition (Greyscale Indian Edition) Paperback – 5 May 2019 by Joel Grus (Author)
2. Practical Data Science with Python: Learn tools and techniques from hands-on examples to extract insights from data by Nathan George (Author)
3. HANDS ON INTRODUCTION TO DATA SCIENCE Hardcover – 2 April 2020 by Chirag Shah (Author)
4. Essential Math for Data Science: Take Control of Your Data with Fundamental Linear Algebra, Probability, and Statistics by Thomas Nield (Author)

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**USER-CENTRIC HUMAN COMPUTER INTERACTION**
**OPEN ELECTIVE**

**Course Code:GR22A3127** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**
1. Learn the concepts of interaction design and how it relates to human computer interaction and other fields.
2. Design how technologies can be to change people's attitudes and behavior.
3. Apply the difference between qualitative and quantitative data and analysis.
4. Extract the social Mechanisms that are used by people to communicate and collaborate.
5. Explore the user Experience design and analyze the factors involved in design

**UNIT I**

**Introduction:** Introduction to User Centric Computing(UCC) and history, Issues and challenges, Latest research trends, User-Centric Design and Software Engineering.

**UNIT II**

**Engineering User-Centric Systems:** Components of SDLC - Contextual Inquiry, - Design Guidelines, Prototyping.

**UNIT III**

**User-Centric Computing:** The UCC framework with illustrative case study, User-Centric models-descriptive, predictive models and taxonomy, Introduction to GOMS family of models

**Computational user models (classical),** Keystroke-Level Model(KLM), (CMN)GOMS Model, The Fitts' Law, The Hick-Hyman Law.

**UNIT IV**

**Computational user models(contemperory):** 2D and 3D pointing models, The steering Law and constrained navigation, Model for hierarchial menu selection, Mobile typing models(sibgle finger and two thumb typing), Model for touch performance(FFitts' law),

**Formal system models:** Introduction to formal models in UCD, Formal modelling of user-computer dialogue.

**UNIT V**

**Empirical Research Methods:** Introduction and research question formulation, Variables determination and experiment design, Data Analysis including model building

**User-Centric Design Evaluation:** Introduction to User-Centric design evaluation and expert evaluation technique, : User evaluation and model-based evaluation.

**Text Books**

1. Samit Bhattacharya (July, 2019). Human-Computer Interaction: User-Centric Computing for Design, McGraw-Hill India, Print Edition: ISBN-13: 978-93-5316-804-9; ISBN-10:

93-5316-804-X, E-book Edition: ISBN-13: 978-93-5316-805-6; ISBN-10: 93-5316-805-8
2. Alan Dix, Janet E. Finlay, Gregory D. Abowd and Russel Beale. (2003). Human-Computer Interaction (3rd Edition), Pearson.

**Reference Books:**

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs. (2009). Designing the User Interfaces: Strategies for Effective Human-Computer Interaction (5th Edison), Pearson

**Website Links:**

https://paragnachaliya.in/wp-content/uploads/2017/08/HCI_Alan_Dix.pdf

**GOKARAJU RANGARAJUINSTITUTE OF ENGINEERING AND TECHNOLOGY**

**DESIGN PATTERNS**

**OPEN ELECTIVE**

**Course Code: GR22A4063** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Ability to analyze and apply different design patterns for real life scenarios.
2. Ability to solve Object oriented design problems with a case study of designing a Document Editor.
3. Illustrates the skill apply creational design patterns.
4. Demonstrates the ability to apply different structural design patterns.
5. Analyze and Apply different behavioral design patterns.

**UNIT I**

**Introduction:** What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

**UNIT II**

**A Case Study:** Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

**UNIT III**

**Creational Patterns:** Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussionof Creational Patterns.
**Structural Pattern Part-I:** Adapter, Bridge, Composite.

**UNIT IV**

**Structural Pattern Part-II:** Decorator, Façade, Flyweight, Proxy.
**Behavioral Patterns Part-I:** Chain of Responsibility, Command, Interpreter, Iterator.

**UNIT V**

**Behavioral Patterns Part-II:** Mediator, Memento, Observer, State, Strategy, Template Method Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History,The Pattern Community An Invitation, A Parting Thought.

**Text Books:**

1. Design Patterns by Erich Gamma, Pearson Education.

**Reference Books:**

1. Pattern's in JAVA Vol-I by Mark Grand,Wiley DreamTech.
2, Pattern's in JAVA Vol-II by Mark Grand,Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III by Mark Grand,Wiley DreamTech.

# GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
## NON-CONVENTIONAL ENERGY SOURCES
### OPEN ELECTIVE

**Course Code:GR22A3019** **L/T/P/C: 3/0/0/3**

**Course Outcomes**

1. Illustrate the concepts of solar radiation at different instants.
2. Analyze the performance characteristics of PV modules.
3. Compare the performance of wind energy at various circumstances.
4. Make use of various sustainable energy resources for power generation.
5. Explain operation and performance of Wave energy, Fuel cells and Batteries.

**UNIT I**

Solar spectrum-Solar Radiation on Earth's surface- Solar radiation geometry-Solar radiation measurements-Solar radiation data-Solar radiation on horizontal and tilted surfaces. Solar Thermal Conversion-Flat plate collectors concentrated collectors- construction and thermal analysis- Solar Applications-Solar Ponds-Heliostat systems-water heater-air heater- solar still.

**UNIT II**

Photovoltaic Cells - Equivalent Circuit - V-I Characteristics- Photovoltaic Modules – Constructional details - Design considerations – Tracking - Maximum power point tracking – Algorithms - PV solar system design with energy backup - Solar Thermo electric conversion.

**UNIT III**

Fundamentals of wind energy-power available in wind-BetzLimit- Aerodynamics of wind turbine-Wind Turbines-Horizontal and vertical axis turbines – their configurations-Wind Energy conversion systems.

**UNIT IV**

Various fuels-Sources-Conversion Technologies-Wet Processes–Dry Processes-Biogas generation–Aerobic and an aerobic digestion- Factors affecting generation of bio gas – Classification of bio gas plants-Different Indian digesters-Digester design considerations-Gasification process-Gasifiers – Applications. Geo-thermal Energy-sources-Hydrothermal Convective-Geo-pressure resources-Petro-thermal systems (HDR)-Magma Resources-Prime Movers.

**UNIT V**

Principle of operation-Open and closed cycles, Energy from Tides-Principle of Tidal Power-Components of tidal Power Plants-Operation Methods-Estimation of Energy in Single and double basin systems-Energy and Power from Waves-Wave energy conversion devices-Fuel Cells-Design and Principle of operation-Types of Fuel Cells-Advantages and disadvantages-Types of Electrodes- Applications-Basics of Batteries –Constructional details of Lead acid batteries- Ni-Cd Batteries.

**Text Books:**

1. G.D. Rai, Non Conventional Energy Sources, Khanna publishers.
2. D.P.Kothari, Singal,
3. Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.

**Reference Books:**

1. B.H.Khan, Non Conventional Energy Sources, PHI Publications.
2. John Twidell & Wier, Renewable Energy Resources, CRC Press, 2009.
3. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**CONCEPTS OF CONTROL SYSTEMS**
**OPEN ELECTIVE**

**Course Code: GR22A3095** **L/T/P/C: 3/0/0/3**

**Course Outcomes**

1. Infer the basic concept control systems.
2. Develop the mathematical model of the systems.
3. Analyze the time domain specifications and steady state error.
4. Outline the concept of stability of the system.
5. Solve the frequency response analysis.

**UNIT I**
**BASIC CONCEPTS OF CONTROL SYSTEM**
Terminology - plant, process, system, disturbances, controlled variable, manipulated variable etc., Block diagram of basic control system, application areas with examples. Classifications of control systems

**UNIT II**
**MATHEMATICAL MODELLING OF SYSTEMS**
Translational and rotational mechanical systems, electrical systems, Force voltage and force current analogy, Block diagram and signal flow graph representation of physical systems along with rules, properties, comparison and limitation, Mason's gain formula.

**UNIT III**
**TIME RESPONSE ANALYSIS**
Standard test signals along with examples of their usage, steady state errors for step, ramp and parabolic inputs, analysis of first and second order systems, Transient response specifications with numerical examples, Basic control actions and two position, proportional, P, PI, PID controllers, Limitations of time domain analysis.

**UNIT IV**
**STABILITY**
Concept of stability, types of stability, Routh's stability criterion, special cases with numerical examples, stability of closed loop system, concept of root locus, open loop and closed loop transfer poles, step by step procedure for root loci, numerical examples.

**UNIT V**
**FREQUENCY RESPONSE ANALYSIS**
Need of frequency response analysis, Sinusoidal response of linear system, methods used in frequency response, Bode Plot, Frequency domain specifications.

**Text Books:**
1. I J Nagrath, M.Gopal, Control System Engineering, New Age International Publishers, Fifth edition.
2. Norman S Nise, Control system engineering, John Wiley & Sons, Inc., Sixth edition

**Reference Books:**

1. Richard C. Dorf, Robert H Bishop, Modern control systems, Pearson Education International, Twelfth edition.
2. A Nagoor Kani, Control Systems, CBS Publishers.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC**
**OPEN ELECTIVE**

**Course Code: GR22A4022** **L/T/P/C: 3/0/0/3**

**Course Outcomes**
1. Outline importance of BNN, ANN and its learning techniques and architectures.
2. Summarize the algorithms for various applications using Back propagation networks.
3. Interpret the concept of Fuzzy and Crisp sets.
4. Model Fuzzy membership Function and rules for Applications.
5. Analyze the parameters of Genetic Algorithm.

**UNIT I**
**NEURAL NETWORKS I (Introduction & Architecture)**
Neuron, Nerve structure and synapse, Biological Neural network, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques.

**UNIT II**
**NEURAL NETWORKS II (Back Propagation Networks)**
Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting back propagation training, application of Neural Networks in Load Forecasting.

**UNIT III**
**FUZZY LOGIC I (Introduction)**
Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

**UNIT IV**
**FUZZY LOGIC II (Fuzzy Membership, Rules)**
Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications & Defuzzification's, Fuzzy Controller, application of Fuzzy logic control in washing machines.

**UNIT V**
**GENETIC ALGORITHMS (GA)**
Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, application of genetic algorithm in economic load dispatch.

**Text Books**
1. J M Zurada , "An Introduction to ANN",Jaico Publishing House.
2. Neural Networks, Fuzzy Logic, And Genetic Algorithms: Synthesis and Applications - by S. RAJASEKARAN, G. A. VIJAYALAKSHMI PAI, PHI publishers.

**Reference Books:**

1. Hung T. Nguyen, Nadipuram R. Prasad, Carol L. Walker and Elbert A. Walker, "A First Course in Fuzzy and Neural Control" Chapman & Hall, CRC.
2. Driankov, Dimitra, "An Introduction to Fuzzy Control", Narosa Publication.Timothy J Ross, "Fuzzy Logic with Engg.Applications", McGraw. Hill.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**COMMUNICATION TECHNOLOGIES**
**OPEN ELECTIVE**

**Course Code:GR22A4045** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Analyze the properties of basic Modulation techniques and apply them to Digital Communication
2. Apply error probability concepts to evaluate the performance of spread spectrum systems.
3. Understand the principle concepts of telecommunication systems and networking
4. Analyze link budgets for satellite communication, considering factors such as path loss, atmospheric effects, and antenna gain.
5. Evaluate the suitability of various technologies in cellular, mobile and wireless communication scenarios.

**UNIT- I: Review of Digital Communication System**

Review of fundamental concepts and parameters in Digital Communication. Digital modulation schemes, Power spectra of digital modulation signals.

**UNIT- II: Spread-Spectrum Modulation**

Introduction, Pseudo-Noise sequences, direct- sequence spread spectrum (DSSS) with coherent BPSK, processing gain, probability of error, frequency-hop spread spectrum (FHSS). Application of spread spectrum: CDMA.

**UNIT- III: Telecommunication Systems:** Telephones Telephone system, Paging systems, Internet Telephony. **Networking and Local Area Networks:** Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

**UNIT- IV**

**Satellite Communication:** Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.

**Optical Communication:** Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

**UNIT-V:**

**Cellular and Mobile Communications:** Cellular telephone systems, AMPS, GSM, CDMA, and WCDMA.

**Wireless Technologies:** Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

**Text Books:**

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2005.
2. Simon Haykin and Michael Moher, “Modern Wireless Communications,” Pearson

Education, 2005. 4. Marvin K. Simon, Sami M. Hinedi and W. C. Lindsay, "Digital Communication Techniques," Eastern Economy Edition, 2010.

**Reference Books:**

1. Principles of communication systems By Taub Schilling, T.M.H
2. Andrew J Viterbi, "CDMA principles spread spectrum communications," Adison Wesley, 1995.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**SENSOR TECHNOLOGY**
**OPEN ELECTIVE**

**Course Code:GR22A3113** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Demonstrate the concept of resistive sensors which can be employed for real life applications
2. Realize the concept of reactive sensors and understand the implications while deploying them in practice.
3. Understand the working principle of special purpose sensors and the need for developing smart sensors.
4. Comprehend the design and development of various wearable sensors for use in healthcare applications.
5. Able to design and perform experiments on the sensors and develop the projects based on the customer needs.

**UNIT-I**

General concepts and terminology of Sensor systems, Transducers classification-sensors and actuators, General input-output configurations, Static and dynamic characteristics of measurement system.

**UNIT-II**

Resistive sensors- Potentiometers, strain gages (piezo-resistive effect), resistive temperature detectors (RTD), thermistors, light dependent resistor (LDR), resistive hygrometers, resistive gas sensors.

**UNIT-III**

Inductive sensors - variable reluctance sensors, Hall effect, Eddy current sensors, Linear variable differential transformers (LVDT), variable transformers, magneto-elastic, magneto-resistive, and magnetostrictive sensors. Capacitive sensors- variable capacitor, differential capacitor.

**UNIT-IV**

Accelerometers: Characteristics and working principle, Types- Capacitive, Piezoresistive, piezoelectric; Gyroscopes: Characteristics and working principle, Rotor Gyroscope; Diaphragm Pressure Sensor –resistive & capacitive type (micro press sensor).

**UNIT-V**

Overview of various smart sensors: Digital temperature sensor (DS1621, TMP36GZ), Humidity sensor (DHT11, DHT22), Gas sensor (MQ2,MQ8), Pressure sensors (BMP180), Accelerometers (ADXL335); Structural health monitoring sensors, Introduction to MEMS and Flexible sensors.

**Text Books:**

1. B. C. Nakra, K.K. Choudhury, "Instrumentation, Measurement and Analysis" -3rd Edition, Tata McGraw, 2009
2. Jacob Fraden, "HandBook of Modern Sensors: physics, Designs and Applications", 3rd ed., Springer, 2010.

**Reference Books:**

1. A.K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", DhanpatRai.
2. Er. R.K. Rajput, "Electronic Measurements and Instrumentation", S. Chand & Company Ltd. 3rd Edition.
3. Bentley, John P., "Principles of Measurement Systems", 4th edition, Pearson/Prentice Hall, 2005
4. Jon. S. Wilson, "Sensor Technology HandBook", Elsevier Inc., 2005.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**INDUSTRIAL AUTOMATION AND CONTROL**
**OPEN ELECTIVE**

**Course Code: GR22A3030** **L/T/P/C:3/0/0/3**

**Prerequisites:** Manufacturing Technology

**Course Outcomes:**
1. Explain the major automation theories, approaches and methodologies used in manufacturing.
2. Apply the knowledge for implementing the automated flow lines.
3. Employ the assembly systems and line balancing for automation
4. Implement the knowledge of material handling and storage systems in current industries.
5. Design adaptive control system for automated manufacturing.

**UNIT I**
**Introduction:** Introduction to automation, principles, reasons, types and strategies of automation, pneumatic and hydraulic components circuits, Automation in machine tools. Mechanical feeding, tool changing and machine tool control transfer the automaton.

**UNIT II**
Automated flow lines: Methods of work part transport transfer, Mechanical buffer storage control function, design and fabrication consideration. Analysis of Automated flow lines: General terminology and analysis of transfer lines without and with buffer storage, partial automation, implementation of automated flow lines**.**

**UNIT III**
**Assembly system and line balancing**: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

**UNIT IV**
**Automated material handling and storage systems:** Types of equipment, functions, analysis and design of material handling systems, conveyor systems, automated guided vehicle systems. Automated storage and retrieval systems; work in process storage, interfacing handling and storage with manufacturing.

**UNIT V**
**Adaptive control systems**: Introduction, adaptive control with optimization, adaptive control with constraints, application of adaptive control in machining operations. Consideration of various parameters such as cutting force, temperatures, vibration and acoustic emission in the adaptive controls systems.

**Text Books:**
1. Mikell P.Groover, Automation, Production Systems, and Computer- integrated Manufacturing, prentice Hall, 2014
2. Serope Kalpakjian and Steven R. Schmid, Manufacturing– Engineering and Technology, 7th edition, Pearson, 2013

**Reference Books:**

1. Automation, Production Systems, and Computer-Integrated Manufacturing. (2016). India: Pearson India.
2. Bolz, R. W. (2012). Manufacturing Automation Management: A Productivity Handbook. United States: Springer US.
3. Boucher, T. O. (2012). Computer Automation in Manufacturing: An Introduction. Switzerland: Springer US.
4. Altintas, Y. (2012). Manufacturing Automation: Metal Cutting Mechanics, Machine Tool Vibrations, and CNC Design. United States: Cambridge University Press.
5. Morriss, S. B. (1995). Automated manufacturing systems. United Kingdom: Glencoe.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**COMPOSITE MATERIALS**
**OPEN ELECTIVE**

**Course Code: GR22A3105** **L/T/P/C: 3/0/0/3**

**Prerequisites:** Material Engineering

**Course Outcomes:**

1. Identify the types of composite materials and their characteristic features
2. Explain the methods employed in composite fabrication.
3. Differentiate the strengthening mechanisms of composite and its corresponding effect on performance
4. Analyze the various criterions for isotropic, anisotropic and composite materials, prediction of laminates failure.
5. Examine experimental techniques utilized for failure mode of composites.

**UNIT I**

Definition and applications of composite materials, Fibers- glass, carbon, ceramic and aramid fibers; Matrices- polymer, graphite, ceramic and metal matrices; characteristics of fibers and matrices. Lamina- assumptions, macroscopic viewpoint, generalized Hooke's law, reduction of homogeneous orthotropic lamina, isotropic limit case, orthotropic stiffness matrix, commercial material properties, rule of mixtures, transformation matrix, transformed stiffness.

**UNIT II**

Manufacturing of composite materials, bag moulding, compression moulding, pultrusion, filament welding, other manufacturing processes

**UNIT III**

Basic assumptions of laminated anisotropic plates, symmetric laminates, angle ply laminates, cross ply laminates, laminate structural moduli, evaluation of lamina properties, determination of lamina stresses, maximum stress and strain criteria.

**UNIT IV**

Von Mises Yield criterion for isotropic materials, generalized Hill's criterion for anisotropic materials, Tsai- Hill's criterion for composites, prediction of laminate failure, thermal analysis of composite laminates.

**UNIT V**

Analysis of laminated plates- equilibrium equations of motion, energy formulation, static bending analysis, buckling analysis, free vibrations, natural frequencies.

**Text Books:**

1. Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill,1994.
2. Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill,1998.

**Reference Books:**

1. Clyne, T. W. and Withers, P. J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Strong, A.B., “Fundamentals of Composite Manufacturing”, SME, 1989.
3. Sharma, S.C., “Composite materials”, Narosa Publications, 2000.
4. Broutman, L.J. and Krock,R.M., “ Modern Composite Materials”, Addison-Wesley, 1967.
5. Introduction to Composite Materials Design by Ever J. Barbero 3rd Edition 2017

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**OPERATIONS RESEARCH**
**OPEN ELECTIVE**

**Course Code: GR22A3018** **L/T/P/C: 3/0/0/3**

**Course Outcomes:**

1. Apply the various linear programming techniques for optimal allocation of limited resources such as machine, material and money
2. Solve transportation problems to minimize cost and understand the principles of assignment of jobs and recruitment policies.
3. Solve sequencing problems and to distinguish various inventory models and develop proper inventory policies
4. Apply game theory to analyze various business competitions and analyze the various waiting line oriented situations.
5. Develop optimum replacement policy and Dynamic Programming Techniques.

**UNIT I**

**Introduction:** Development – Definition– Characteristics and Phases of operations Research– Types of models – operation Research models– applications.

**Allocation:** Linear Programming Problem Formulation – Graphical solution – Simplex method –Artificial variables techniques -Two–phase method, Big-M method – Duality Principle.

**UNIT II**

**Transportation models:** Formulation – Methods for finding feasible solutions; North west corner rule, Least cost entry method, Vogel's approximation method. Optimal solution; MODI method. Unbalanced transportation problem and Degeneracy.

**Assignment models -** Formulation – Optimal solution **-** Variants of Assignment Problem

**UNIT III**

**Sequencing**: Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines.

**Inventory**: Introduction – Single item – Deterministic models – Purchase inventory modelwith one price break and multiple price breaks – shortages are not allowed – Stochastic models – demand may be a discrete variable or continuous variable – Instantaneous production. Instantaneous demand and continuous demand and no set up cost.

**UNIT IV**

**Theory of games**: Introduction – Minimax (maximin) – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – dominance principle– m X 2 and 2 X n games -graphical method.

**Waiting lines**: Introduction – Single Channel – Poisson arrivals – exponential service times – with infinite population and finite population models– Multichannel – Poisson arrivals – exponential service times with infinite population single channel Poisson arrivals.

**UNIT V**

**Replacement**: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely, group replacement.

**Dynamic programming:** Introduction – Bellman's Principle of optimality – Applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

**Text Books:**

1. Operations Research - Prem Kumar Gupta and D S Hira/ S Chand Publishing/ 2015
2. Operations Research / S. D.Sharma / KedarNath RamNath Publication/2020

**Reference Books:**

1. Operations Research / R.Panneerselvam, 3rd Edition/PHI Publications/ 2023
2. Operations Research An Introduction - Hamdy A Taha/8 th Edition/ Prentice Hall/2006
3. Principles of Operations Research: With Applications to Managerial Decisions - Harvey M. Wagner/Prentice-Hall Operations Research/2020
4. Operations Research - Kanthi Swarup, P.K. Gupta, Man Mohan Sultan Chand & Sons/ 2019
5. OperationsResearch/A.M.Natarajan,P.Balasubramani,A.Tamilarasi/Pearson Education/2006

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**ENGINEERING MATERIALS FOR SUSTAINABILITY**
**OPEN ELECTIVE**

**Course Code: GR22A3009** **L/T/P/C: 3/0/0/3**

**Pre-requisites:** Building materials and construction planning, Concrete Technology

**Course Outcomes:**
1. Describe the different types of environmental factors effecting materials
2. Report the work in sustainability for research and education
3. Illustrating the broad perspective in thinking for sustainable practices
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify and compare cost and performance of building materials

**UNIT I**

Sustainability – Introduction, Need and concept of sustainability, Social- environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols – Clean Development Mechanism (CDM), Environmental legislationsin India – Water Act, Air Act

**UNIT II**

Air Pollution, effects of Air Pollution; Water pollution-sources, Sustainable wastewater treatment, Solid waste-sources, impacts of solid waste, zero waste concept, 3R concept, Global environmental issues- Resource degradation, climatic change, Global warming, Ozone layer depletion, Regional and Local Environmental issues. Carbon credits and carbon trading, carbon foot print.

**UNIT III**

Green Building Materials, Basic concepts of sustainable habitat, green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; non-renewable Energy of Materials

**UNIT IV**

Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds like acetone, formaldehyde, BTEX substances, Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials

**UNIT V**

Green Building Planning and Specifications**,** Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green

Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste &Water

management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption

**Text Books:**

1. Alternative Building Materials and Technologies (2007) – K S Jagadeesh, B V Venkata RamaReddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures (2002)– AskoSarja – SPON Press
3. Non-conventional Energy Resources (2012) – D S Chauhan and S K Srivastava – New AgeInternational Publishers

**Reference Books:**

1. Green Buildings (2007) McGraw hill publication by Gevorkian
2. Emerald Architecture (2008) case studies in green buildings, The Magazine of Sustainable Design
3. Understanding Green Building Guideline (2010): For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
4. Understanding Green Building Materials (2011) Traci Rose Rider, W. W. Norton & Company Publisher.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE**
**OPEN ELECTIVE**

**Course Code:GR22A3086** **L/T/P/C: 3/0/0/3**

**Pre-Requisites:** Surveying and Geomatics

**Course Outcomes:**
1. Interpret the fundamental concepts of Geographic Information Science and Technology along with different data structures.
2. Demonstrate Map creation and design principles, including thematic map display, employment of map projections and cartographic design.
3. Analyze the types of digital maps for different themes.
4. Apply the spatial analysis to remote sensing data to generate thematic maps.
5. Solve the real life problems associated with geospatial and remote sensing.

**UNIT I**
Fundamentals of GIS – Information Systems, Modelling Real World Features Data, Data Formats, Applications of GIS, – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques, Hardware – Computing, printing and scanning systems; Software – Standard Packages like Arc view, ArcGIS (commercial) & Auto-CAD Map, Map Info etc. QGISopen software- Salient features.

**UNIT II**
Topology – Types of Errors, Editing and Error Rectification, Types of Topology, Modeling topological Relationships, Tolerances.

**UNIT III**
Map – mapping concepts, analysis with paper-based maps, limitations, Computer Automated Cartography– History and Developments, GIS- Definition, advantages of digital maps.

**UNIT IV**
Spatial Analysis and Modelling – Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modelling, DTM/DEM, Integration with Remote Sensing data

**UNIT V**
GIS Project Planning and Implementation – Under Standing the Requirements, Phases of Planning, Specifications, Data Procurement, Tendering, Human Resources, Back Up, MonitoringProgress

**Text Books:**
1. Concepts & Techniques of GIS by C. P. Lo Albert, K. W. Yonng, Prentice Hall (India)Publications, 2nd edition, 2016.
2. Fundamental of GIS by Mechanical designs John Wiley &Sons, 4th edition, 2008.
3. Principals of Geographic Information Systems – Peter Beur and Rachael A.Mc Donnell, Oxford Publishers 2016.

**Reference Books:**


1. Remote Sensing and Geographical Information systems by M. Anji Reddy JNTU Hyderabad.4th edition, 2014, B. S. Publications.
2. Introduction to Geographic Information Systems by Kang-tsung Chang, Tata McGraw-HillPublishing Company Limited- 2008.
3. Remote sensing of the environment –An earth resource perspective by John R Jensen, PrenticeHall 4. GIS by Kang – tsung chang, TMH Publications & Co., 2nd edition, 2013.
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications, 1st edition,2016.
5. Remote Sensing and its applications by LRA Narayana, University Press 1999.
6. Remote sensing and image interpretation by Thomas Lillesand, 7th Edition, John Wiley&sons,6th edition 2011.
7. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, WileyPublishers, 2012.

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**
**ENVIRONMENTAL IMPACT ASSESSMENT**
**OPEN ELECTIVE**

**Course Code:GR22A4011** **L/T/P/C: 3/0/0/3**

**Pre-Requisites:** Environmental science

**Course Outcomes:**
1. Identify, predict and evaluate the environmental effects of proposed actions and projects.
2. Explain the appropriate methodologies for environmental impact prediction and assessment.
3. Analyze the importance of Public Participation, Fault Tree Analysis and Consequence analysis in EIA.
4. Understand the activities in environmental auditing.
5. Plan EIA for developmental projects.

**UNIT I**
Introduction: Concepts of EIA methodologies – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – Evolution of EIA: Screening and scoping; Rapid EIA and Comprehensive EIA

**UNIT II**
Introduction to EIA, Criteria for the selection of EIA Methodology, General Framework for Environmental Impact Assessment, Characterization and site assessment. Environmental Risk Analysis,Definition of Risk, Matrix Method; Checklist method.

**UNIT III**
Prediction and Assessment: Public participation Fault tree analysis, Consequence Analysis; Socioeconomic aspects, measures of the effectiveness of pollution control activities;

**UNIT IV**
Environmental Legislation: Introduction to Environmental Management Systems; Environmental Statement - procedures; Environmental Audit: Cost-Benefit Analysis;

**UNIT V**
Life Cycle Assessment, Resource Balance, Energy Balance & Management Review - OperationalControl - Case Studies on EIA with reference to Indian Scenario.

**Text Books:**
1. Y Anjaneyulu, and Valli Manikkam, Environmental Impact Assessment Methodologies, BSP BooksPVT Ltd., 2nd edition, 2011.
2. R.R. Barthwal, Environmental Impact Assessment, New Age International Private Limited, 2nd edition, 2012.
3. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 2nd edition,1997.

**Reference Books:**

1. Kolluru Rao, Bartell Steven, Pitblado R and Stricoff "Risk Assessment and Management Handbook", McGraw Hill Inc., New York, 1996.
2. Judith Petts, Handbook of Environmental Impact Assessment Vol. I &II, Blackwell Science,1999.
3. Cutter, S.L., "Environmental Risk and Hazards", Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
4. Anji Reddy Mareddy, Environmental Impact Assessment: Theory and Practice,
5. Butterworth- Heinemann publisher, 1st Edition, 2017.
6. MoEF & CC, Govt. of India: EIA notification and subsequent amendments